Accurate Chaining.

Written for ENGINEERING NEWS,

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Chaining is a very simple operation, and doubtless, everyone thinks he knows all about it. Many there are who will claim that they can do absolutely accurate chaining. But the results of inaccurate chaining in the past is a continual annoyance to the present generation of surveyors and engineers, and the day of unnecessarily inaccurate work is probably not yet passed. The following remarks are intended to apply specially to land surveying:

It goes without saying that the means used in the past have been rude, and the results correspondingly inaccurate; but, owing to the increase in value of land, and the reflex action of the general advancement in other directions, there seems to be a growing desire for increased accuracy in the methods of land surveying. To assist in this laudable reform is the purpose of this article, although increased accuracy in chaining is but one of the steps leading to the desired end.

Before considering the several errors to which chaining is liable, it will be well to notice that, in all measuring operations, the observer should carefully distinguish between two classes of errors, viz:—*compensating* errors, or those which are as likely to be plus as minus, and tend to balance each other; and *cumulative* errors, or those which always have the same sign, and effect the final result in the same way. This distinction is very important. The observer should avoid errors which usually occur in a single direction, but he need not always take the greatest care to avoid errors which are as liable to be negative as positive. An apparently inappreciable but cumulative error may, in the course of a series of observations, amount to more than a much la ger but compensating error. The effect of compensating errors is reduced nearly to zero simply by multiplying the number of observations; but cumulative errors should be avoided entirely, or observations made by which they may be corrected.

The uncertainty in the length of a line due to compensating or accidental errors, varies as the square root of the number of units in the line, while the effect of cumulative, or constant errors varies directly as the length. The whole number of cumulative errors remain uncorrected, while only the square root of the compensating errors are uncompensated. For example, if the chain is 0.1 of a link too long, a line 25 chains long will be recorded 2.5 links too short; but if the pin is sometimes set 0.1 of a link beyond the end of the chain, and sometimes the same amount behind, the final error at the end of the line, due to this error is 0.1525, or only 0.5 links.

If the head chain man has a fixed habit of always setting the pin beyond the end of the chain, then this becomes a cumulative error, and varies as the distance. This illustrates that in the prosecution of any work, it is desirable that the operator should be cognizant of the nature and importance of every source of error. The more thorough and complete his knowledge in this respect, the more readily and accurately will he be able to decide what source of error may be wholly neglected, what may be partially provided against, and what must be carefully avoided or eliminated. This knowledge is conducive of both greater accuracy and of economy of time and effort, for the observer then knows what might otherwise have been attended to with considerable care, may be neglected, thus leaving him free to give all his attention to the weakest link in the chain of observations. It enables the observer to correctly proportion his pains to the degree of precision required. A good observer is one who is able to take just care enough to attain the desired accuracy, without wasting time and energy in uselessly perfecting certain parts of the work. He must be able to discover the relative accuracy required in different parts of a complete observation. All this calls for a clear understanding of the causes of error, and the ability to reason out their effect upon the result.

SOURCES OF ERROR.—The sources of error in chaining are: 1, incorrect length of chain; 2, kinking of the chain and bending of the links; 3, the chain not being drawn straight; 4, unequal tension of the chain; 5, expansion and contraction with changes of temperature; 6, errors of lining the fore chain man; 7, not placing the pin at the end of the chain; 8, drawing the pin by hanging the back handle over it, and 9, such errors as miscounting tallies, or chains, counting from wrong end of chain, making a mistake of 10 in the number of links, reading 18 for 22, 37 for 43, etc. This last class of errors are much too common, but can be obviated by care and thoughtfulness.

1. This is a constant or cumulative error; when one is desirous of attaining the last degree of accuracy, this is the most difficult error to eliminate; even for the degree of accuracy attained in land surveying, it is an important element. In some classes of work, relative accuracy is sufficient, in which case an arbitrary standard may be chosen. In the location of permanent land lines, nothing less than absolute accuracy should be aimed at. Probably the only way to reach a reasonable degree of accuracy if to have the length of a number of standards determined by some competent authority, as the coast survey or an authorized representative.

Some recent experience of the writer will illustrate the difference which exists between supposed true standards. He had occasion to compare a 100 foot steel tape just from the shop of a reputable manufacturer, which was "guaranteed to be true to U. S. standard," with a 20 foot pole said to have been pronounced correct by the "U. S. A. engineers," and also with a standard derived, certainly with inappreciable error, from two 2 ft. steel rules made by the best tool makers in the U. S. The errors of the intercomparisons were also inappreciable. The tape was 0.95 of an inch short by the first, by the second it was 0.45 of an inch short.

A subsequent comparison at the office of the Mississippi River commission shows the tape to be 0.25 ± 0.07 of an inch short. The above differences are practically independent of temperature correction.

After the chain has once been adjusted to the standard, it should be frequently tested. The common chain has 600 wearing surfaces, and if each wears only .01 of an inch, the length is increased 6 inches. Mud and ice in the joints have a similar opposite direction. A tempered steel chain with brazed links, lengthened half an inch by chaining 70 miles. It is nothing uncommon to find chains differing 1, 2 or even 3 inches.

2. The simplest remedy for kinking of the chain and bending of the links is to use a steel tape or wire. A tape or wire obviates the effect of wearing of the links of a chain, as well as having some other advantages.

A steel wire makes an excellent substitute for a chain, The end of the unit may be indicated by a small tube or rod with a hole through it fastened near each end. The distance may count from corresponding ends of the tube or rod, or from a V-shaped groove around the rod; for accurate work the former is used, the end being marked on the top of a stake or a board carried for that purpose; for less accurate work, the pin is to be set in the groove. There are several advantages in this way of putting the pin, which will appear on reflection. A handle can be formed by passing the wire through a piece of wood to protect the hand, and then forming it into a loop. The wire should be steel, at least $\frac{1}{4}$ of an inch in diameter. The whole can be made in any shop at a trifling cost.

3. The time required to get the chain straight between pins can be greatly lessened by the fore chainsman being careful to walk on line. The error is cumulative.

It is sometimes advocated that, since the chain is seldom, if ever, perfectly straight, it should be made a little longer than the standard, so that the full length of the standard may be laid off each time. The instructions issued by U. S. Land Office to Surveyor's General states (report for 1880, page—, for the first(?) time that "the 66 feet chain shall be 66.06 feet," for the above reason. The French have, or at least had (Gillespie's Land Surveying, page 18, foot-note) a similar practice, the addition being from 1 in 1000 to 1 in 2000. The remedy is at best, very questionable.

4. The effect of a difference in the pull upon the chain or tape is small, and varies as the length of the tape, inversely as the cross-section, and is less for steel than iron. With a steel wire $\frac{1}{4}$ in diameter a difference of 10 pounds will make a difference of one twenty-fifth of an inch. For a chain with bronzed links it would be more owing to the flattening of the rings. It could be determined by trial with a spring balance. It is generally compensating.

5. Only with the extremes of temperature will the expansion and contraction of the tape be appreciable in ordinary work. In accurate work it is one of the chief sources of error, and one very difficult to determine. The temperature of the chain, when the sun is shining, is often quite a good deal higher than that of the atmosphere. For a 100 feet tape, a change of 30° makes a difference in length of one fortieth of an inch. Generally this error is cumulative.

6. The error due to not setting the fore pin exactly in line is generally overestimated in proportion to the other errors. An undue amount of time is therefore given to lining in the fore chain more. With a 66 feet chain, if the pin is out of line 1 foot the error is $\frac{1}{4}$ of an inch; the error varies inversely as the length of the chain. It is cumulative. There is no reason why a wire 200 or even 300 feet long should not be used for most of the work where a 66 feet chain is now employed; such a wire would be both more accurate and more speedy.

Vertical inequalities in the ground produce errors similar to those in aligning the fore chainman, and unfortunately in many cases this element limits the degree of accuracy attainable. It is cumulative. It can only be obviated by suspending the tape or wire between fixed supports, which is complicated and expensive. Supporting the tape by hand and plumbing down is of very little advantage.

7. Many chainmen hold the pin, while setting it, in such a manner that the point enters the ground considerably in front of the end of the chain; when the rear end is brought forward, it is laid on the ground, thus introducing considerable error. The remedy is obvious.

The very general practice of placing the forward handle against one side of the pin, and the back one against the other side, can not be considered very precise. The same side of the pin should be used both times; the length of the chain is then from outside of one handle to the inside of the other.

8. The back handle should not be dropped over the pin until the chain is in position preparatory to lay off the distance, or some device similar to the V-shaped groove, described above, should be used.

LIMITS OF PRECISION.—It is very desirable that each surveyor should know the uncertainty of his ordinary work; if this could be stated for each method of measuring and for the different kinds of ground it would be very instructive. Each survey should learn by re-

peated trials the amount of labor required to attain a given degree of accuracy. Everybody knows that the labor required increases more rapidly than the degree of precision attained, the more accurate the work the greater the difference.

The method of least squares shows that in a series of observations affected only by accidental errors, the final error varies as the square root of the number of observations. Now many of the errors of chaining are cumulative, that is, conspire to make the recorded length too long; hence the method of least squares is not applicable, although it is sometimes so applied. If the error is assumed to vary as the square root of the distance, *i e* as the number of times the unit is applied, other things being equal, the longer lines will show apparently the more accurate work; if it is taken proportional to the distance, the longer lines will appear less accurate as between two lines measured under the same conditions, the errors should vary as the square root of the distance. That is, if the difference between two measures is multiplied in a quarter of a mile, it should be twice as much in one mile.

A few words are needed about the difference between real and apparent errors. If a line is twice measured with the same chain by the same men under the same conditions, the difference between the two measurements represents the difference between the accidental errors each time, and does not show the real error in the observed length. Any constant or cumulative error, as an incorrect length of the chain, would be the same in each. This distinction is very important in discussing the error of any series of observations.

The following data is given to assist the surveyor in deciding what he will call accurate work. Unfortunately there is very little on this subject to be found in engineering literature. If any one having reliable data on this subject will publish it with full details, it will afford an opportunity for some instructive comparisons which may ultimately lead to an increased precision.

Burt (Key to the Solar compass, page 35) found that "the average error in surveying the public lands to be 1 in 500, and sometimes 1 in 220 as between two sets of chainmen; under the most favorable conditions it was 1 in 1600.

The writer's students, in ordinary class work in land surveying, measured lines from 200 to 1000 feet long, with a 66 foot chain, and repeated with a difference of 1 in 15,000 to 1 in 20,000 for the same men; for different men on different days with different chains (compared however with the same standard), the maximum difference was 1 in 800 to 1 in 1000, the average error being 1 in 3000 to 1 in 4000. The ground was favorable, but the work was done with the ordinary expedition of actual practice. Seventy miles of the finished track of the Illinois Central R. R., was measured in 1876 with a 100 foot steel chain, and re-measured in 1885 with a 100 foot steel tape, with a difference, after correcting for the difference of standard and applying a correction for wear of the chain, on the average for the different miles of 1 in 2,360.

On the Atchison, Topeka and Santa Fé R. R., through Western Kansas, the difference between the preliminary survey and the government land survey averaged about 1 in 1000; the difference between the preliminary survey and the location was about 1 in 2500.

The U. S. A. engineers in remeasuring the Union & Central Pacific R. R., found the error of their own work to average 1 in 23,600, the maximum being 1 in 10,000, as determined by retracing distances varying from 2000 to 26,000 feet (See House Ex. Doc., No. 37, 2nd session, 44th Cong., pp. 10, 14, 21, 37, after correcting errors of transcription).

On the U. S. Lake Survey, (See Rept. of Chf. Eng. U. S. A., 1876, Part III, page 9) base lines for topographical surveys were made with a chain 20 meters long, differing from the ordinary chains only in being made of heavier wire and having links 20 inches long; in 15 lines, the maximum error was 1 in 5700, the mean being 1 in 17,500, and the minimum 1 in 41,100.

In connection with the U. S. Lake Survey work, a line 12 miles long was measured on the railroad track with a wire 150 feet long, at the rate of about 10 miles per day, with a difference between two measurements of 1 in 32,000.

The U. S. Coast Survey Report 1882, page 191, contains an account of the preliminary measurement of two base lines with an iron wire $\frac{1}{8}$ of an inch in diameter, 200 feet long, in which the difference, as compared with the measurement of the geodedic base apparatus, was 1 in 30,000 and 1 in 28,000.

CONEY ISLAND.

Its Present Sanitary Condition and the Need of Future Sanitary Improvements.

Examination Made and Report Prepared for ENGINEERING NEWS.

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I

Directly in front of the southern extremity of Long Island and separated from it by a narrow, shallow and tortuous salt water channel, lies Coney Island, now one of the most popular seaside resorts on the Atlantic Coast. It is a comparatively narrow strip of land, not quite a mile wide in its widest part at the center of the island, and a little over five miles in length. The island lies almost due east and west, with its southern front directly exposed to, and washed by, the waves of the Atlantic Ocean. As shown on the map* it is reached from New York and Brooklyn by direct steamer lines, by numerous railroads, by a horse car track, and a wide avenue or drive from Prospect Park in Brooklyn. The village of Coney Island belongs to the town of Gravesend, Kings County, Long Island. The water channel separating the island from the main land (Long Island), is about two miles in length, and is commonly known as the Coney Island Creek. As shown on the larger map,† it empties at the eastern end into Sheepshead Bay, where a rapidly growing village of the same name, composed of summer residences and fishermen's cottages has sprung up. At the western end the creek flows into Gravesend Bay, along the shores of which are situated the villages of Gunthersville, Locust Grove and Bath. On both sides along the course of the creek are situated numerous salt water marshes. The whole of Coney Island is practically a large and almost level sand bar, the highest point of which, if we except a few sandhills at the western end of the island, is but a few feet above the level of high tide. The fine sand beach of the island offers superior facilities for sea bathing, and being in close proximity to the Metropolis and its sister city, Coney Island soon became a favorite and rapidly growing pleasure resort for the multitudes who escape from the heat of the great city to enjoy during an afternoon or evening the delightful cool sea-breezes, while others, numbering several thousands make a more permanent sojourn, and crowd the hotels and boarding-houses. From the western extremity to almost the east point of the island a vast number of pleasure resorts, hotels, bathing pavilions, restaurants, boarding-houses, have sprung up in rapid succession within the last few years. Beginning at the east, we have the large and commodious Oriental and Manhattan Beach Hotels, each able to accommodate over 500 guests. About the center of the island another large hotel, the Brighton Beach Hotel with Bathing Pavilions is located, connected with the Manhattan Beach Hotel grounds by the Marine Railway. Further west, and reached from the Brighton Beach Hotel either by elevated railway or by the well-kept driveway, known as the Concourse, is West Brighton, where numberless large and small hotels, boarding-houses and railroad depots are grouped closely together. It is a matter of some difficulty to make any even merely approximate estimate of the number of pleasure seekers who visit the island on a single bright summer day. It is claimed by railroad and steamboat officials that at times from 100-150 000 people are congregated upon this comparatively narrow space of land.

To the engineer who devotes his attention to the important problem of how to remove and dispose of the waste-water and waste matters incident to human life, a question of great magnitude presents itself at once, namely how to dispose of the large volumes of sewage of Coney Island in a safe, efficient and at the same time economical manner. To discuss this question is the object of these articles. The writer has, at the request of ENGINEERING NEWS devoted much time and labor to the study of the present sanitary condition of the island, in particular of the means at the present time in vogue for disposing of its sewage and garbage. It will become evident from the detailed description that the existing sanitary, or rather unsanitary, arrangements are utterly inadequate and to be severely condemned as directly opposed to the interests of the public health.

Sewage and Garbage Disposal at Coney Island.

Up to within a comparatively recent period of time no system of sewage disposal worthy of the name existed. The Point Breeze Hotel, a smaller hotel, now closed, located at the farthest eastern extremity of the island, sent all its wastes directly into Sheepshead Bay, and most of its sewage was probably carried away with the outflowing tide, the current being very strong at this point. The large Manhattan Beach Hotel, previous to the erection of the Oriental Hotel, discharged all of its solid and liquid sewage into the upper head of Sheepshead Bay. The Brighton Beach Hotel had a pipe-sewer discharging all wastes capable of being removed through pipes, into Coney Island Creek. By both hotels, and by a number of short house-drains from cottages along its shores, the waters of Sheepshead Bay rapidly became very much polluted. Since about the year 1880 a system was introduced at the Brighton Beach Hotel, by means of which the coarser solids were retained, while liquids only, together with dissolved sewage matter and some finely suspended matter were allowed to flow into the creek at a point indicated on the map. At about the same time a new sewer was built for the Manhattan Beach Hotel, which joined the sewer from the newly erected Oriental Hotel and discharged into a side arm of Sheepshead Bay, the new outlet being located, as shown on plan, much further to the east than the old outlet of the first Manhattan Beach Hotel sewer. The details of the new systems will be described farther on.

At West Brighton and the western end of the island matters soon got into a condition seriously threatening to endanger the public health. Thousands of privies disposed of the human excreta in the most primitive and offensive manner. They simply consisted of wooden sheds with a board seat, erected over an excavation in the sand, usually of only a shallow depth. Into these holes filth was continuously poured until they became filled, when a little sand was possibly raked so as to cover the excrements, and a new hole dug close to the old spot. Under this superficially clean stratum of white sand lie masses of decomposing human filth, for the sand is unable to absorb or render innocuous any part of it. No outlets or drains being available, the liquid wastes from urinals, washbasins, kitchen sinks and laundry tubs, in other words, the slopwaters, are allowed to run into the sand underneath the very buildings, the supposition being that all the liquid would soon soak away, while in reality it at once fills the innumerable pores of the sand to remain there in a putrefying state, often overflowing to the very surface of the ground, and emitting, under the influence of a hot August sun, most nauseating stenches. To aggravate the condition of affairs, there was no manner whatsoever of garbage disposal, and solid refuse of all descriptions was carelessly allowed to accumulate under the very buildings, emitting in hot weather a most sickening and offensive stench. The water supply, except a small portion taken from rain-water cisterns, was at first derived from shallow dug or driven wells, and not only was the water brackish in taste, but owing to the numerous vaults, privies and cesspools surrounding the wells on all sides, the water soon became very much contaminated and unfit for use. Within the last years this serious defect has been obviated by a private company supplying water to the western half of the island, including Brighton Beach Hotel, the water being brought to the island in iron pipes under pressure from the main land. This general water supply, however beneficial in providing pure, uncontaminated potable water, proved by no means an unmitigated blessing, for the difficulty always arising in villages and towns, provided with an ample water supply, but not having a system of sewers, soon made itself strongly felt at Coney Island. With the increased facilities for drawing water in any desired quantity for household purposes, the consumption of water soon increased to a like degree. Some of the better class of hotels at the West End, the Iron Pier restaurants, and some of the railroad depots began to introduce plumbing fixtures, and all the vast amount of waste water from waterclosets, urinals and sinks was necessarily disposed of by running into cesspools, rarely built with any regard toward tightness and freedom from leakage, and by necessity located close to or even right underneath the buildings. The consequence was a rapid increase of the pollution of the sandy soil, and, simultaneously, a greater degree of contamination of the air. The emptying of those few cesspools, which were comparatively tight, and of the much larger number of those which, although built with the intention of allowing sewage to soak away in

* The editors of ENGINEERING NEWS are under obligation to Mr. C. C. Overton, publisher of the Coney Island Directory for the use of this cut. See Page 179.

† This map is based upon the large chart, issued by the U. S. Coast and Geodetic Survey. See Page 181.

the sand, soon became filled and choked, caused new nuisances, and as an incidental drawback the pouring out of the removed contents from cesspools into the western end of Coney Island creek created further troubles, and added new sources of pollution to the waters of Gravesend Bay, already rendered impure from much solid floating garbage dropped from the New York City garbage boats, as well as by local drains from cottages and hotels situated along its shores.

It became evident that, unless some method or system would soon be devised to get rid of Coney Island's filth and garbage, its prosperity would surely suffer a serious loss. The local Board of Health and the town Supervisors were fully alive to the gravity of the situation, and it is due mainly to their unremitting efforts that a bill was passed in 1884 by the State Legislature and signed by the Governor, authorizing the immediate construction of a sewerage system. The most important terms of this bill are as follows:

"The Board of Health shall have power to construct sewers and dispose of the sewage whenever a majority

of the property owners in any proposed district shall petition; the board has the right to enter any street to cause necessary surveys and maps, and may purchase lands or rights of way and have control of such lands and rights of way;—shall fix and determine the route and grade, may advertise for plans and specifications; may enter into contract for the construction or for a proper system and disposal of the sewage. After the board have determined on a sewer or system of sewers and have agreed as to the route and grade, and made necessary surveys and maps of the district and adopted a plan and received proposals, notice shall be given by advertising for a meeting to hear objections, and the board may amend alter reverse, amend or reject any and all proposals—may enter into contract, and shall submit to the supervisor a copy of all papers relating to the matter, showing cost of same, when the supervisor shall borrow on the faith and credit of the town, and in its name execute and issue registered bonds of not less than $500 nor more than $1000, bearing interest at 5 per cent. Two-fifths of such bonds shall be made payable in 15 years and the balance in twenty years from date. The town treasurer may, however, call in and redeem any of the bonds before maturity when in funds belonging to the respective sewer districts; the bonds shall be signed by the supervisor, town treasurer and secretary of the Board of Health—the bonds to be sold by proposals; the supervisor and town treasurer to furnish bonds for $5000 for the faithful performance of their duty in the matter of accounting of the money. The supervisor shall certify to the Board of Supervisors before their first meeting in August the amount necessary to be assessed in the general taxes on the lands and premises of the proposed sewer district, one-twentieth part of the whole each year, and the Board of Supervisors shall thereupon apportion, levy and assess on the lands and premises in any such sewer district, the amount to be collected in the same manner as the general taxes; the board may employ a proper person to superintend the construction of such sewers and disposal of the sewage and employ the necessary labor to clean and keep the same in good repair and working order, and shall fix the price for each connection and regulate the granting of permits. All business in connection therewith shall be done in the name of the Board of Health of the town of Gravesend. The Board shall certify to the Board of Supervisors how much moneys are required to keep and maintain the sewers for the next fiscal year, and the Board of Supervisors shall assess the same upon the lands and premises benefitted. This sum will also be paid with the general taxes. The act states that nothing in this act contained shall in any manner apply to or affect the Prospect Park and Coney Island R. R. Co., or any lands or property held or possessed by it, for railroad or depot purposes, in case said corporation shall grant a right of way across such lands for the construction and maintenance of a sewer to be constructed under the authority of this act, nor shall any of the provisions of this act apply to or affect the Manhattan Beach Railroad Co., or the concourse lands and parkway on Coney Island belonging to the county of Kings."

It is much to be regretted that this bill does not include all the property, thus providing for the proper sewerage of the whole island. It does, however, refer more particularly to the most thickly settled portion of the island, where sanitary improvements are certainly most urgently needed.

No special plan of sewering the island has as yet been adopted. But numerous projects and plans, some of them impracticable, others practicable but costly, and hence looked upon with disfavor by the tax-payers, have from time to time been proposed.

To these, reference will hereafter be made.

Before doing so, a brief account will be rendered of the detailed examination of Coney Island, made by the writer from August 24 to August 29. In making this sanitary survey the writer has received much valuable assistance from, and desires to acknowledge his thanks to, the following gentlemen, viz., Supervisor and Chief of Police, John Y. McKane, R. L. Van Kleek, M. D., Health Officer of Gravesend, Robt. Burkhardt Esq., Inspector of Police, O. D. Mott, Esq., Superintendent Manhattan Beach Improvement Company, Geo. D. Staples, Esq., Engineer in charge of Manhattan Beach Pumping Station at Sheepshead Bay, Jas. J. Powers, Esq., Sanitary Engineer of Brooklyn, and Mr. C. C. Overton, Publisher of the Coney Island Directory.

Manhattan Beach and Oriental Hotels.

All of the buildings belonging to the Manhattan Beach Improvement Company, the two large hotels, the bathing houses, drugstore, lunch pavilion, and the railroad employes' and hotel servants' dormitories are connected by branch pipe sewers with the main sewer which is made of cement pipe, 12 inches inside diameter, and circular in shape. This main sewer begins at the rear and east end of the main hotel building (it is shown on the map in dotted lines), and runs north of and parallel to, the railroad track in an eastward direction. A second main sewer, of egg-shape, 12 inches × 18 inches inside dimensions, of cement, serves to receive all the sewerage of the large Oriental Hotel, and starting at the eastern extremity of this building near the engine house runs also, as shown, in an eastward direction and about parallel to the Manhattan sewer to a distance of about 2,500 feet from the Oriental Hotel. Here both main sewers are joined into a trunk sewer, said to be 22 inches high, of egg-oval shape, made of cement. A man-hole with tight iron cover is placed over the junction, and numerous inspection holes are located along the lines of both main sewers. In addition to the waste water from water-closets, kitchens and laundries both sewers receive all the rain water falling from the roofs of the buildings. A short distance beyond the junction the trunk sewer makes a turn to northeast and runs into a cove of Sheepshead Bay, into which it empties. There is, apparently, no ventilation by man-holes or otherwise provided to the whole length of the main sewer. Its exact fall could not be ascertained, but the total fall must be very little, yet it is said that the sewer is kept free from sediment, or deposit, recourse being had, if necessary, to artificial flushing by means of a force-pump located in the engine house of the Oriental Hotel.

The outfall sewer consist of a wooden box, supported on piles, about 30 inches wide and about 4 feet deep and is made of ample capacity for holding the sewage which might accumulate for several days during unusually high tides. Its mouth was closed by a suitable gate arrangement, and until the year 1883 this sewer delivered the whole sewage including all the solid and greasy matters into the bay, at ebb tide only, it being hoped that the outward tidal current would carry all floating matters as well as suspended sewage particles out to sea. This arrangement worked only imperfectly, and caused numerous complaints from the inhabitants of the opposite shore of Sheepshead Bay, and of the people using the waters of the bay for rowing, sailing or fishing purposes. The bay was, indeed, becoming seriously polluted and the shore rapidly filled with solid waste matter from the hotels. The Manhattan Beach Improvement Company, therefore, rearranged the outfall or trunk sewer in such a manner as to retain all solids, allowing only the liquid sewage to flow off into the bay. To effect this mechanical separation the outfall box sewer was divided into two sections of great length, each section forming a sort of a receiving chamber, the intention being to use the two chambers alternately. A simple valve arrangement, at the upper end of the trunk sewer, enabled the man in charge of the outfall sewer to turn the stream of sewage into the nearest receiving chamber while the solid matter was meanwhile removed from the other chamber. A short connection between the main sewer and the furthest settling chamber by means of a pipe sewer, run parallel and at one side of the trunk sewer, completed the arrangement. To retain the solids two wire strainers, the first having 1¼-inch meshes, the second having ¼-inch meshes, were arranged inside of each wooden box. From each of them a T-shaped overflow pipe dipping well below the surface of the liquid so as not to catch any scum or floating matter, delivered the liquid thus strained into salt water. At each high tide the outfall is largely covered by water, and it is assumed that the action of the salt water will be to aid in effecting a precipitation of the solids. Whether this actually occurs appears somewhat doubtful. The solids in that tank which is not in operation, are then mixed with gypsum and charcoal, removed from the chamber and placed on a dock, situated at the sewer outfall, where the whole mass is allowed to dry. It is stated that it is used in the fall and spring of the year as manure on the lawns and flowerbeds of the two hotels. The large volume of manure piled up on the dock appeared to indicate that such use was not made of it during the last winter.

Before inspecting the sewerage of the two hotels, I had, on a previous day, independently, examined the outlet of the hotel sewer at extreme low water. I was unable, during this examination, to detect any solids floating anywhere in the water. It is true, however, that the water for a long distance about the outfall was polluted by the foul and unpurified liquid sewage, for it should be remembered that no matter how carefully the solid matter is strained from sewage, the liquid retains dissolved matters and finely suspended organic matters, which consist of the most highly putrescible and noxious elements of sewage. This pollution was quite apparent even at high water. The bottom of Sheepshead Bay consists largely of a layer of from 12 to 18 inches of black mud, due probably to decayed sea vegetation, and emitting a very foul and offensive odor. I gained the impression that a part of its offensiveness might be due, in addition, to the sewage poured continuously into the Bay, not only from the Hotels, but from the Sheepshead Bay cottages as well. It appeared to me as if the bottom around the outfall sewer was particularly foul. Inquiries from fishermen revealed the fact that the fishing had been poor in the bay during the last years, although it used to be very good many years ago. This may largely be accounted for by the fact that until a comparatively recent period of time the acid sludge from the Manhattan Beach Gas Works was discharged into the bay. It is partly due, without doubt, to the pollution of the bay by putrefying sewage. It was learned that some of the cottages at Sheepshead Bay complained this summer just at the time when this sanitary examination was in progress, about solid sewage matters discharged from the large hotels into the bay. As already stated, I was unable to verify this complaint. It is, no doubt, true that the whole process of sewage disposal at the outfall of the Manhattan Beach Company's sewer is little better than a makeshift. All that is accomplished by it is simply the mechanical separation, by strainers, of the coarser solids from the liquid sewage. No attempt whatever at purification of the foul liquid sewage, by any process of filtration or chemical precipitation is made, and it must be obvious that a large quantity of very offensive dissolved organic matter, together with finer suspended or flocculent sewage matter is continuously poured into the bay. The settling tanks, having

originated by making use of the trunk sewer for such purpose, are evidently of a very improper shape, being much too narrow and too long. They are also improperly located, being exposed to the action of the flood tide. If the outfall would be carried about 500 feet further out into the main channel and located below low-water level, the rush of the outgoing tide might possible dilute the sewage sufficiently and also carry much of it out to sea. As at present arranged, a part of the sewage discharged will necessarily remain in the hollow coves of Sheepshead Bay. I believe, furthermore, that the process of drying the solids in the open air on the dock, leaving the whole mass fully exposed, may, with a south-easterly direction of the wind, become offensive to the inhabitants of the shores of Sheepshead Bay.

To prevent further pollution of the Bay a law should be enacted forbidding the discharge of any sewage whatsoever, whether solid, semi-liquid or liquid, into the Bay. I believe this discharge of sewage is already forbidden to all cottages situated along the shore of Sheepshead Bay, and, if so, the law should certainly be made to apply to the large hotels, the daily aggregate sewage of which is equivalent to that of a whole village like Sheepshead Bay.

I can see no good reason why the main sewer of the two large hotels should not be carried eastward to the fullest eastern extremity of Coney Island, near the old Point Breeze Hotel. If this were done I should, however, exclude all, or nearly all, of the rainwater, for its addition to the sewage proper must necessarily render any purification process much more costly and troublesome. Suitable settling tanks with strainers should be arranged near the outfall, of a much larger size than the present temporary arrangement. I think that no possible danger of a pollution of the beach could be apprehended from sending the unpurified liquid sewage out to sea at the point indicated. If, however, found necessary or desirable, a system of chemical precipitation, by perchloride of iron, or milk of lime together with a solution of sulphate of alumna, or by the so-called A-B-C process, might readily be arranged. As an alternative plan, the strained liquid sewage might be filtered through a Farquhar-Oldham sewage filter of suitable size. The only possible objection to the proposed new outfall might consist in the danger of heavy high tides exposing and washing away parts of the outfall sewer in winter time. This might be overcome by a strong and suitable construction of the sewer, although it would necessarily involve a large expenditure of money. The conclusion would appear to be that the future outfall sewer of the Manhattan Beach and Oriental Hotels should be located at Point Breeze, particularly if, as contemplated, a number of summer cottages will be erected in the rear of Manhattan Beach Hotel, in which case the reconstruction of the entire sewer would, in any case, become necessary.

Permission could not be obtained to inspect the system of plumbing and house drainage at either of the large hotels. I have only been able to examine, to a certain extent, the waterclosets and urinals for the Railroads Depot at Manhattan Beach. I did not find these of a very satisfactory character, although they were kept in a good and cleanly condition by the janitor in charge. The urinals are single porcelain urinals, flushed with water by stop cocks, which, however, are seldom opened by the users. The waterclosets are all pan-closets, enclosed with tight woodwork and flushed by means of the usual pull-up arrangement, from a large water tank situated over the closets. The flush was good and the bowls appeared to be in a cleanly condition, but a rather offensive odor from putrefying filth in the water-closet container—never absent in pan-closets after a year or more of use—pervaded the apartment. Leaving aside the fact that the pan-closet is the acknowledged worst type of a water-closet, it is evident that any arrangement by which the flushing of a closet is made to depend on the pulling up of the water-closet handle by the person using the closet, must necessarily be very unsatisfactory owing to the negligence of the public in a place frequented to such an extent as these water-closets are during the summer season. There is also too much woodwork, encasing the water-closets, exposed to fouling.

The only other plumbing work that I was enabled to see was the gentlemen's toilet room in the lunch pavilion, situated in the rear of the Manhattan Beach Bathing Houses. Here closets of the same faulty arrangement as just described, are in use.

The urinals are porcelain lipped bowls, flushed from a service pipe, controlled by a stop valve. The wastes are trapped by unvented, and hence unsafe, lead S-traps. From what little plumbing work I was permitted to see, I do not think that the plumbing at the hotels compares favorably with recent work elsewhere.

An excellent system of water supply has been arranged for both hotels and the minor buildings connected with them. All the buildings have ample means for extinguishing fires, large standpipes being erected with hose-reels and nozzles on all floors. A large number of fire-buckets are conspicuously distributed throughout the halls as additional means of putting out a fire. The water is brought to the grounds of the Manhattan Beach Improvement Company from the main land through a 5-inch cast-iron water pipe. Water is derived from a number of wells, about thirty feet deep, of which eight are the ordinary driven wells while three are so-called Dollard Wells. They are distributed along the track of the Manhattan Beach Railroad near the station at Sheepshead Bay, and each has a suction pipe branching from the main section, which is a wrought-iron pipe, 5 inches diameter. The driven wells have each a 2-inch suction wrought-iron pipe. The "Dollard" wells are constructed as follows: Tubes of rolled sheet iron, eighteen inches in diameter, and in sections of 4 feet length, are sunk in the sandy substratum, each section being bolted to the preceding one. Inside of this tube are placed eight-inch vitrified pipes, the sides of which are perforated at, and below, the level of the ground water. The joints of these pipes are made tight with sulphur. The space between the outside of the tile pipe and the wrought-iron jacket is next filled with roofing gravel, which is intended to act as a filter. The outer 18-inch casing is finally removed and a 3-inch wrought-iron suction pipe inserted into the vitrified pipe. Usually the level of the ground-water reaches to within five feet of the surface. Complaint was made by certain parties to the State Board of Health during the present summer that the water supply of Manhattan Beach was rendered dangerous by being surrounded by a number of water closets and sink drains, all said to be within 150 feet of the pumping station.

The Health Officer of Gravesend, Dr. R. L. Van Kleek, was instructed to make a careful inspection of all the privy vaults and cesspools within 200 feet of the wells referred to. An analysis of the drinking water was also made. The inspection revealed the following facts: "The nearest water closet is 56 feet distant, the next 90 feet, the third 100 feet, the fourth 115 feet, the fifth about 150 feet, and the sixth 200 feet away. The nearest cesspool is 146 feet distant, the second cesspool is 166 feet, the third 186 feet away. So within 75 feet there is but one water closet instead of twelve, as was stated in the complaint, and within 175 feet there are four additional ones besides two cesspools. The Health Officer found all the vaults and cesspools in good condition. The wells supplying water to the Manhattan Beach Improvement Co. are situated on the east side of the L. I. railroad track, the first well is 30 feet north east of the pump house, the tenth and last one is 287 feet in the same direction. When they were constructed there was not a single dwelling within 1,000 feet, and the company had no reason to suppose that there would be any dwelling near them for a long period of time. But within the last three years about twenty-five buildings have been erected within 500 feet of the pump-house, and it is probable that each year will see more buildings erected in this locality. All these buildings, and in fact all Sheepshead Bay village (containing in the summer season 2,500 individuals at least) is supplied with water from wells half a mile to the North, which also supply the town of Gravesend and Coney Island. The water supply is unlimited, but there is no corresponding sewerage, and this will make soil saturation with decomposing wastes absolutely certain." What Sheepshead Bay Village needs as much as Coney Island is a proper system of sewerage for the removal of household wastes.

The following shows the result of a chemical analysis of a sample of Manhattan Beach Supply water, drawn June 30, 1885, at the pumping station at Sheepshead Bay. The analysis was made by Charles M. Stillwell, A. M., and Thomas G. Gladding, A. M., Analytical and Consulting Chemists to the New York Produce Exchange:

Odor, when heated to 100 degr. Fahr.	None.
Chlorine	2,188 grains in U. S. Gallon.
Phosphoric Acid	Trace
Nitrogen in Nitrates	0.020
Free Ammonia	0.001
Albumenoid Ammonia	0.002
Hardness	3,500
Total Solids	8,750
Organic and Volatile	3,500
Mineral	5,250

The water was declared, according to chemical standard, to be a good potable water.

The pumping station contains three No. 8 Knowles direct-acting pumping engines. The following are the principal dimensions:

Diameter of steam cylinder	12 inches
" " water cylinder	7 "
Length of stroke	12 "
Average number of strokes per minute	65-75
Water pumped in U. S. Gallons per stroke	1.99
Size of steam supply pipe	2 inches
Size of suction pipe	5 "
Size of discharge pipe	5 "

Steam is furnished by two boilers, the main boiler being a horizontal, 40 horse-power, tubular boiler, 3' 8" inches diameter, with 48 3-inch tubes, and return flue draft, built by the Erie Iron Works, and supplying steam through a 2-inch main pipe to the pumping engines. The second boiler is a vertical, 25 horse-power, boiler 3' 6" inches diameter, supplying the two feed pumps to both boilers, one of which is a N° 0 Knowles, the other a small Davidson direct-acting pumping engine. Both boilers are connected, so that in case of an emergency, or when the large boiler is being cleaned, the smaller one may be used to supply steam to the pumps. Pressure of steam, usually 60-70 pounds per square inch. The large boiler may also be fed with water directly by the main pumps.

Usually two pumping engines are kept running day and night, but at the height of the season it occasionally became necessary to use all three pumps. It is said that ordinarily about 200,000 gallons are pumped per 24 hours. An enlargement of the pumping-station is contemplated, and also the laying of a new 8-inch main pipe to the island. The system of supply is somewhat on the Holly principle, the pumps driving the water directly into the pipe main leading to the Hotels, no reservoir or stand-pipe being used. The principal main is a 5-inch cast iron pipe delivering the water into two large water-tanks at the beach, one supplying the hotel, the other supplying the locomotive engines. Each tank is stated to have a capacity of from 18-22,000 gallons. The water pressure in the main usually amounts to about 60 pounds per square inch.

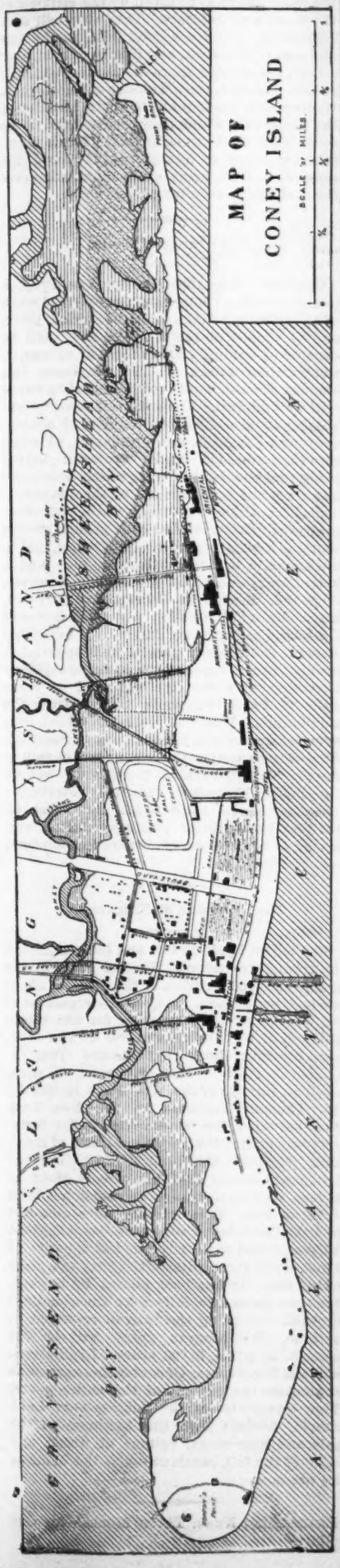
As regards the system of garbage disposal of both the Manhattan Beach and Oriental Hotels this is excellent and could hardly be improved. All kitchen garbage, meat offal, etc., is removed daily in barrels on special cars of the Long Island R. R., and sent by train to a large hog farm on Long Island. Not only the beautiful grounds in front of the houses, but the whole place at the rear of both hotels is kept in a most excellent condition of cleanliness, comparing very favorably with other places. A constant source of annoyance and even danger to health, so frequently incurred in summer and seaside resorts is thus removed, in a satisfactory manner.

Brighton Beach Hotel and Bathing Pavilion.

This hotel at first discharged all of its sewage directly into Coney Island Creek. In 1880, the proprietors of the hotel engaged Mr. Jas. J. Powers, sanitary engineer of Brooklyn, to reconstruct its whole drainage. Since then the system, put in by Mr. Powers has been in continuous operation. All the plumbing work inside of the hotel was remodelled, the soil pipes extended through the roof, and new water-closets fitted up Those on the second floor are pan-closets flushed from special cisterns. The water-closets on the ground floor are earthenware hoppers of the Philadelphia pattern, having a whirling flush supplied by a valve, which is operated by door action, water being taken from an elevated tank, serving the water-closets only. Each hopper, by this arrangement, receives a liberal flush immediately before as well as after use. The hoppers appeared clean and inoffensive, and the apartment was entirely free from any disagreeable odor. Each hopper is trapped by a 4-inch lead trap with brass trap-screw at its lowest point, to enable the person in charge of the closet to remove obstructions from the trap and to empty the traps in winter time. The valve flush however, appears insufficient to drive all matters through the traps, except by repeated flushings. A well shaped flushing rim hopper would offer many advantages, if supplied by a large down pipe directly from a valve cistern operated by the door The liberal supply of water, and the frequent use of the closets, tend however, combined, to keep them free from foulness. The urinal in the same apartment is a Jennings cast-iron, galvanized round stall urinal, with a large bowl, holding a volume of water, which is frequently renewed by a constantly running supply pipe. All the cellar work is well laid out and consists of 2, 4 and 6-inch heavy iron soil pipe, all the branches joining the main drain by Y branches. The main 5 and 6-inch branches are united into a large 7-inch house-drain, which is flushed automatically, at intervals, from a flush tank, placed at the head of the drain, and fed from the 2-inch waste-pipes from lavatories and bath-tubs. The main drain carries all the hotel sewage, and kitchen and laundry wastes to a set of two settling tanks situated about 1000 feet at the rear of the hotel, under the coalsheds of the Brooklyn, Flatbush, and Coney Island R. R. Rain water from roofs is entirely excluded from the system.

Each of the settling tanks which are built of planks with closely fitting and well fastened covers, is about 25 feet long, 7 feet wide and three feet deep. The tanks are used alternately, a valve arrangement being provided, enabling the workman in charge to turn the sewage stream into one of the tanks, while the other one is being cleaned and emptied. Each tank contains two compartments, a retaining chamber for the solids, and a chamber for the liquid sewage. The latter flows from the first into the second chamber by means of a T-shaped overflow pipe dipping well below the water level. The chamber for the solids is moreover provided with iron wire strainers to retain all solids and foreign matters such as brushes, boots, bottles, towels rags, napkins and bits of wearing apparel, which accumulate to a large extent during the summer season.

The liquid sewage chamber contains a siphon and a ball-cock. When the tank is nearly full, the ball-cock opens a valve, and a suitable quantity of a chemical solution (of the exact character of which I was not informed, probably perchloride of iron) stored in an iron boiler tank is added, the effect of which is to hasten the precipitation of the flocculent suspended matter



When filled, a very simple siphon arrangement goes into operation, and discharges the liquid sewage through a long sewer pipe into Coney Island Creek. When the solids have accumulated in the first settling chamber, the sewage is turned into the other tank, and a quantity of lime or gypsum and fine charcoal is added to the solids to deodorize them. They are then removed and carted away upon a compost heap where they are gradually turned by drying in the air into a black poudrette. The tanks are cleaned on the average about every 30 days during the summer season. There was a slight smell about the tanks, owing probably to the difficulty of keeping the covers shut air-tight. I examined a large heap of the manure, piled upon the salt water meadows in the rear of the hotel. It was inoffensive and to all appearance constitutes an excellent fertilizer. It was used on the lawns and flowerbeds of the Brighton Beach Hotel until recently, when the flowerbeds in front of the hotel were destroyed and washed away by high tides. It is likely that the poudrette can be readily disposed of by selling it to farmers.

A system, in all respects similar to the one described was arranged by Mr. Powers for the disposal of the sewage of the Brighton Beach Bathing Pavilion. Two tanks arranged as above, but of somewhat smaller dimensions are provided, located in the rear of the pavilion, and the strained sewage is then delivered into Coney Island creek.

I examined the outlet of the larger works at extreme low tide. The outlet sewer of the hotel is located, as shown on the map, at a point where the Brooklyn, Flatbush & Coney Island R. R. crosses the creek on a trestle work. At the time of my visit the sewage was just being discharged into the creek. A very offensive odor of putrifying sewage was noticeable in the direction of the wind at some distance from the mouth of the sewer. A dark stream of sewage, diluted with the water from the creek, was running in a sluggish course towards the head of Sheepshead Bay. Much flocculent matter appeared suspended in the water. The banks of the creek about the sewer outlet appeared to be greatly polluted. In my judgment this indicated that the purification was but incompletely carried out, and may not be due to a fault in the system of sewage disposal adopted. Possibly the quantity of chemical precipitating solution added is insufficient. I also believe that the time between the adding of the disinfectant to the liquid sewage and the discharge of the siphon tank is not sufficient to allow the flocculent matters to be precipitated. Both defects might easily be remedied. As at present operating, there cannot be much doubt that the Brighton Beach Hotel sewer contributes a large share to the fouling of Coney Island Creek and of Sheepshead Bay. I examined the outlet again the following day at high water tide, and found the water of the creek perceptibly polluted for a long distance, although the smell at the outlet was not near so offensive. With ebb-tide the diluted sewage is carried into Sheepshead Bay, and partly returns with the change of the tide. This fact may, to a certain extent, account for the pollution of the waters of Sheepshead Bay.

In examining the immediate surroundings of the Brighton Beach Hotel I found in some places heaps of garbage, carelessly left to remain near the windows of the hotel. A better attention to the perfect cleanliness of the grounds situated in the rear of the hotel would undoubtedly remove such possible causes of air pollution.

The hotel and the Bathing Pavilion are supplied with water from the same works which supply the water to the village of Sheepshead Bay to the town of Gravesend and to Coney Island proper.

West Brighton.

By this name is generally understood the western end of Coney Island. It includes a vast conglomeration of hotels, railroad depots, boarding houses, places of amusement, the two iron piers, the observatory and several sea-side homes. The examination of this part of the island revealed an almost inconceivable degree of foulness, and it is no exaggeration to say that the soil is in many places reeking with decomposing filth. A few of the better hotels have water-closets, the contents of which are discharged into cesspools, which latter are emptied at night. The usual practice has been to cart the contents of the cesspools away and to dump them into Coney Island Creek. The village Board of Health stopped this pernicious practice, and, as a temporary measure of relief, the material is now taken to the western point of the Island at Norton's Point, where it is partly buried in the sand, and well covered and partly dumped into the sea when the tide is turning.

The Railroad depot of the Prospect Park and Coney Island R. R., has well-fitted up water-closets and urinals discharging into cesspools, the contents of which are emptied at night. The water-closets are short enamelled iron flushing rim hoppers, flushed by seat action from special cisterns. The woodwork about the closets consists in only the seat, which is supported on iron legs, the space under the closet being left open for inspection. A janitor is in constant attendance. Considering the severe use to which the water-closets are necessarily put in such a frequented railroad station, they were found in a cleanly and satisfactory condition.

At the Brighton Pier the sewage from water-closets, bathtubs, urinals and sinks is collected by a system of wrought-iron screw-jointed drain pipes, all pipes being collected into one large 7-inch main pipe, carried out to the end of the pier, where the sewage is discharged below the level of low water into the sea. A similar system is arranged at the new Iron Pier, where, however, the pipes are ordinary plumber's cast-iron hub-pipes. A close inspection revealed a number of leaky joints in the main drain as well as in the branch pipes. At many leaky joints the waste water was dripping on to the sand of the beach in large streams. If we consider that in the neighborhood of the iron piers the beach is at times thronged from morning until night with pleasure seekers and children, many of whom seek shelter from the sun's rays under the iron pier, just where the leaky pipes pollute the beach, it seems a somewhat surprising fact that such serious defects should have been allowed to continue unabated. There can also be little doubt that some of the sewage, discharged into the sea, is returned with the change of tide and pollutes the beach. If the practice of delivering the sea directly into the sewage would be more generally followed, a serious nuisance would soon be created. The sewage from both iron piers should, therefore, be taken into the general system of sewerage, which it is hoped will soon be available at Coney Island.

Most boarding-houses and smaller hotels have merely common privies, and deliver kitchen and urinal waste water directly on to the sandy surface. Some of the privies were filled with decomposing putrid masses of human filth. No attempt of covering the excreta with ashes or loam could be found anywhere. The stench in some of the most crowded blocks was something appalling. Exposed to the heat of the sun, these places would seem to be veritable hot-beds of disease. Of course, the cool sea breezes act as a rule most favorably in counteracting the evil effects of such contaminated atmosphere. During calm nights, however, the vile stenches must be very much felt, located as some of these places are, directly under the windows of some hotels and boarding-houses, or even directly underneath the buildings. The privies and urinals of the Sea Beach Coney Island, and of the Brooklyn Bath and Coney Island Railroad Station were found to be in a most disgraceful condition. The lack of proper and cleanly public water-closet accommodations for both sexes at West Brighton is very much felt.

It is, unfortunately true, that until a complete system of sewerage has been provided for the island, cesspools for stopwater must be used. There is no reason, however, for making the absence of sewers the excuse for the shameful condition of affairs prevailing. Even admitting the difficulty and expense incident to obtaining fresh loam or garden earth from the main land, I believe that the larger and better places, and also the railroad stations named, owe it to the public and to the patrons to provide accommodations more decent and free from offense, in the shape of earth-closets. The value of earth-closet manure would, without doubt, be appreciated by the farmers on the main land, and the frequent emptying of the earth-closet boxes could easily be arranged by some attention to the matter. The tub or pail system could be also arranged, if a number of property-owners or landlords would act harmoniously together, and would help greatly in decreasing the existing evils.

Another matter requiring immediate attention is the removal of the garbage and the cleaning of the streets. At present no system whatever exists. Some of the better places have the kitchen offal and swill carted away, but all of the smaller places, the numerous restaurants and oyster houses throw their refuse directly under the buildings or even into the streets, where it is left to decompose and rot, constituting an offense at once to the eyes and to the noses of the passers by.

A serious nuisance, which should be abated as early as possible, consists in the swampy lands located north of the concourse, and adjoining both sides of the large drive or boulevard, (see the map). These lands belong to Kings County and are under the jurisdiction of the Brooklyn Park Commissioners. All the conditions favorable to the breeding of malaria, are found here. The land was intended for a park, but no work in that direction has yet been done. What is now a source of danger to health could be made, by a reasonable expenditure of money for draining and filling-in, a beautiful spot. The Board of Health of Gravesend condemned this locality, not long ago, as a serious detriment to public health.

The waterworks, supplying Coney Island, the town of Gravesend, and the village of Sheepshead Bay with water, belong to the Kings County Water Supply Company, and were erected and built in 1880 by Benjamin F. Stephens, Esq. The water is taken from 16 large wells, from 30 to 50 feet deep, sunk into the gravelly substratum and walled up with brick masonry. The wells are situated near the track of the Brooklyn, Flatbush and Coney Island Railroad, about ¾ of a mile north of the station at Sheepshead Bay. A large brick engine-house contains two pumps and a set of boilers. A boiler-iron stand-pipe is erected near the pumping-station. It is twenty feet in diameter up to a height of

about 80 feet, and thence reduced in diameter up to a total height of about 120 feet.*

The pumps are Knowles direct-acting pumps, No. 11, having a total daily capacity of 1,000,000 gallons daily. Only one pumping engine is operated usually, day and night. Of the two 40 horsepower boilers, only one boiler is used at the time. The feed-pump is a small Knowles direct-acting pump. Water is pumped into the standpipe and delivered from it by a large 16-inch cast iron main to several miles of distribution pipes. If a higher pressure than 55 pounds in the mains is desired, the standpipe is shut off, and the water pumped directly into the pipes. Owing to the peculiar character of the population supplied, most of whom are visitors only, while the permanent residents are but few in number, the consumption of water is very variable.

Such is, described briefly and without the least exaggeration, the present sanitary condition of Coney Island. In the next paper the various plans proposed from time to time to render the locality more healthful and free from offense will be discussed, and the outlines of a system of removal and disposal of the sewage and of the garbage of Coney Island will be given.

(TO BE CONTINUED).

*The writer endeavored to get the exact dimensions of the standpipe as well as other additional information from Mr. Stephens, the Superintendent of the Works, to whom copy of these notes on the works were submitted, but was not favored with a reply. W. P. G.

The Supply of Water by Meter.

At a recent meeting of the Midland Counties Division of the Association of Municipal and Sanitary Engineers and Surveyors, Great Britain, a paper on "Some Advantages and Results of the Supply of Water by Meter for Domestic Consumption," was read by Mr. G. Winship, of Abington.

The author said that in cases where local authorities were compelled to carry out works of water supply, the charges for water for domestic consumption were hard to determine; and a heavy rate must often fall unevenly upon the various occupiers of property in the district. He was of opinion that the charges for water for domestic consumption by meter would tend to equalize the burden imposed, for less cost would be incurred in the original outlay from the fact of less water being required; the meter system causing such a considerable reduction in the quantity of water consumed. The cost of meters to consumers must not be taken into account, because, as soon as the meter was attached to the service-pipe in connection with any premises, payments at the rate of ten per cent. commenced; and it was not essential that any excessive stock of meters should be kept in hand. The cost of gravitation schemes of water supply was stated by Mr. T. Hawksley to average nine pence per 1,000 gallons. The cost of the Abingdon works was a fraction under eleven pence per 1,000 gallons. From these facts the author concluded, not that the capital must be doubled unless the supply were by meter, but that it must be considerably increased, to enable the engineer to obtain the increased quantity of water required for purely domestic consumption. The cost of inspection by the meter system was so much reduced that some mention must be made of it. Another important advantage of this system, to certain authorities, occurred in those districts where pumping of the sewage had to be resorted to. A further advantage would also be likely to accrue to all authorities where the sewage was disposed of by irrigation. Another advantage, in the case of the consumer, was that the amount paid for water, whatever the rate per 1,000 gallons might be, was in proportion to the amount consumed. The price per 1,000 gallons might be high or low; but it did not affect the relative charge for water consumed. Surely it must be manifestly unfair to charge the same rate to adjoining houses, rated at (say) £50 a year each, but occupied probably by ten persons in one case, and by twenty persons in the other.

The author looked upon the water supply as being in the hands of the local authorities; and therefore the question of whether the works should prove remunerative or not, upon the capital invested, was a secondary matter, the health of the town being the principal object in view. The sum required for management and payment of principal and interest is not obtained from the income derived from water supplied was recoverable in the same manner as in the case of sewerage works. The author found from experience that consumers of water by meter took care to have better fittings; and they were able to effect this at really less cost than would be the case if no meters were used, because expensive cisterns were not necessary under the meter system, where the supply was constant. It should be born in mind that great objection was made against gas meters when they were first introduced; and the author trusted that if members had not been convinced of the applicability of the meter system, they must understand that the matter was still in its infancy. He could only add that the consumers at Abington appeared to be thoroughly satisfied with this system as a basis of charge.

In the course of the discussion on the paper, Mr. Pritchard said he did not approve of the scheme for measuring the consumption of water. He pointed out his objections on sanitary grounds and said he thought that waste of water could be prevented without the adoption of Mr. Winship's proposal. Mr. Gordon took a similar view; thinking that, if water meters were used, the consumers would constantly have before them the thought of the water bill. Everything would, he said, be done to keep it down; and he feared the result would be an evil one. The working classes should, as far as possible, be induced to use water in the freest possible way. Mr. Fowler thought that the Association should be the last to sanction the system of water meters. To restrict the water supply of a town was to take, as he considered, a narrow view of the question with which they had to deal. Mr. Comber agreed that the water supply should on no account be restricted, or the people who most wanted water would fail to get enough of it. Meters were very expensive, required much repairing, gave great trouble in the winter, and, and were generally unsatisfactory. The expense of water meters was likewise dwelt upon by Mr. Baker, who urged that it would be difficult to start the system in a large town, in consequence of the high initial cost of the meters.

Dials of Public Clocks.

The figures are generally made much too large. People have a pattern dial painted, and if the figures are not as long as one-third of the radius, and therefore occupying, with the minutes, about two-thirds of the whole area of the dial, they fancy they are not large enough to be read at a distance; whereas, the fact is, the more of the dial is occupied by the figures the less distinct they are, and the more difficult it is to distinguish the position of the hands, which is what people really want to see, and not to read the figures, which might very well be replaced by twelve large spots. The rule which has been adopted, after various experiments, as the best for the proportions of the dial is this:—Divide the radius into three, and leave the inner two-thirds clear and flat, and of some color forming a strong contrast to the color of the hands—black or dark blue if they are gilt, and white if they are black, The figures should occupy the next two-thirds of the remaining third, and the minutes be set in the remainder, near the edge and with every fifth minute more strongly marked than the rest; and there should not be a rim round the dial, as there generally is, of the same color or gilding as the figures. Where a dial cannot be put without interfering with the architecture, it is much better to have none, as is the case in many cathedrals and large churches, leaving the information to be given by the striking of the hours and quarters. This also will save something, perhaps a good deal, in the size and cost of the clock, and if it is one without a train remontoire or gravity escapement, will enable it to go better. The size of public dials is often very inadequate to their height, and the distance at which they are intended to be seen. They ought to be at least 1 foot in diameter for every 10 feet of height above the ground, and in many cases more, whenever the dial will be seen far off.—*F. Dent.*

Absorbency of Walls.

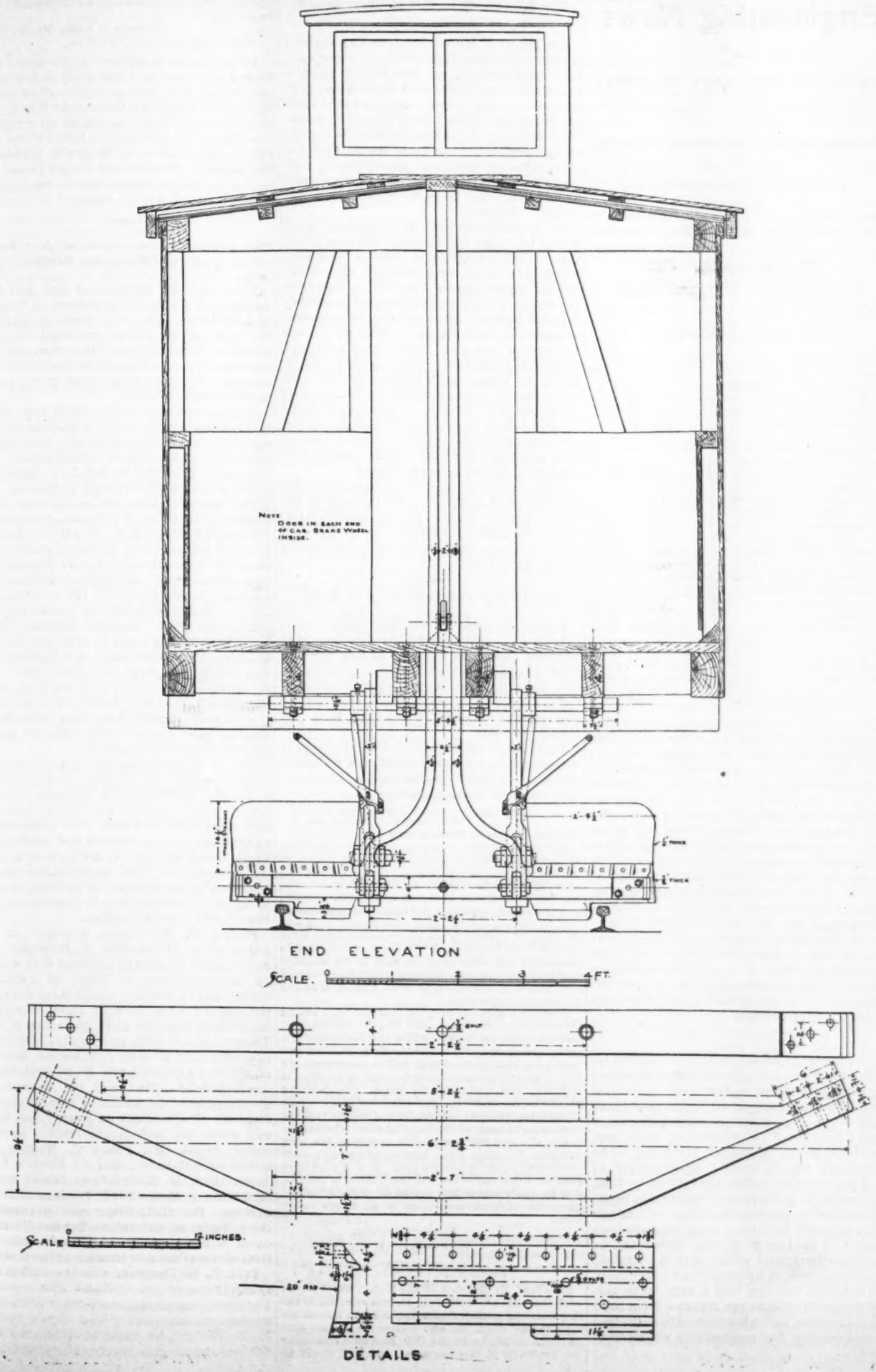
Common bricks absorb as much as a pint or pound of water. Supposing the external walls of an ordinary cottage to be one brick thick, and to consist of 12,000 bricks, they will be capable of holding 1,500 gallons, or 6½ tons, of water when saturated. To evaporate this amount of water would require nearly a ton of coal well applied. The softer and more workable stones are of various degrees of absorbency, and are often more retentive of moisture than common brick. Professor Ansted states that the facility with which sandstone absorbs water is illustrated by the quantity it contains both in its ordinary state and when saturated. He states that even granite always contains a certain percentage of water, and in the dry state is rarely without a pint and a half in every cubic foot. Sandstone, however, even that deemed fit for building purposes, may contain half a gallon per cubic foot, and loose sand at least two gallons. When water presents itself in any part of such material, it readily diffuses itself by the power of capillary attraction, by which it is observed on some walls in Paris, it ascends 32 feet from the foundations. Walls of such absorbent construction are subject to rising wet by capillary attraction as well as the driving wet of rain or storm. To guard against the driving wet on the coast, expensive external coverings—"weather slates"—are used. But these do not stay the interior rising wet. This wet, having to be evaporated, lowers temperature. —*E. Chadwick.*

The Recession of Niagara.

Sir Charles Lyell, in 1841 and 1842, estimated the gradual recession of Niagara Falls by the undermining of its brink at the rate of about one foot per annum. Recent investigations of the subject by a Commission for the establishment of a State reservation at the falls, have, however, shown that this and other estimates are more or less erroneous. A map, based on surveys of the falls made in 1883 by Mr. Thomas Evershed for the New York State surveyor, has shown that in the forty-one years ending 1883 the annual rate of maximum recession has been 6½ feet. For the eight years ending 1883 this rate is given as 16½ feet, so that the rate of recession has been higher of late. These results were obtained from the Canadian Fall, while the American Fall was found to have receded at the rate of 10 inches per annum during the forty-one years ending 1883. It has been shown by the surveys that those two falls were once united; and that, supposing the rate of recession to continue, the Niagara gorge will be cut through in some 10,000 years. Lyell's estimate was 35,000 years. Of course these attempts to calculate the cutting of the entire gorge, which terminates at the heights near Lake Ontario, assume that the hardness of the shale and lime-rocks, volume of water, and height of the fall, continue much the same as they are now.

ENGINEERING NEWS, Three Months for One Dollar.

FIG. —*b*.—FLANGING CAR, END ELEVATION AND DETAILS.



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WATER-WORKS construction is very active throughout the United States just now. Our columns of water news items plainly indicate this. But we are also assured by water-works contractors that never before have they been so busy. They consoled us also with the intelligence that, enterprising as we undoubtedly are, in raking the entire continent for news, there are yet numerous schemes being worked by private companies which are sure to escape our drag-net until after the contracts are let. While we naturally lament our inability to get advance information of these adventures, yet we are consoled by the knowledge that our readers are bound to hear of them almost immediately after franchises have been secured. If there is any person or journal in this country ahead of us in this department of news gathering we would be pleased to hear of such.

THIS business of collecting contracting intelligence is peculiar. Every contractor wants the earliest intelligence, but every individual contractor is as dumb as an oyster concerning work to be let. Railroad corporations are generally opposed to publicity of their contemplated work. Municipal work has to be advertised, but is usually so advertised in local papers as to confine the letting to local contractors, it not being the intention to invite active outside competition; where our advertising columns have been used, we have been assured of the benefit of the investment by the advertisers, and we know to a certainty that in the case of water-works construction, and in bridge building that a very large saving to the advertisers has resulted from their using a medium which is admitted to be the best in this country for constructive engineering work.

The Sanitary Condition of Coney Island.

The report of Mr. Gerhard, on the sanitary condition of Coney Island and its future sanitary improvement, the first half of which is published in this issue, is of importance, in its general bearing, to every sea-side resort along the Jersey and Long Island coast. Time was when the laws of sanitation could be ignored or trifled with, but the dense populations that each summer brings to these places, have made it imperatively necessary that measures should at once be taken to preserve not only comfort, but life.

Mr. Gerhard has then, at our request, made a very thorough examination into the conditions existing at the most popular New York resort, and in another issue will suggest the needed improvements. As will be seen from the report of this competent expert in sanitary matters, the past, and even the present state of affairs, is about as bad as bad can be; and the law of last year, authorizing sewerage, comes none too soon. The conditions under which the sewage must be disposed, are awkward, but they are paralleled at the majority of the sea-side villages or towns, from Long Island to Cape May, and it is with the intent of doing good to the greatest number that we have had this particular locality intelligently examined, and its needs discussed.

As this is a subject far-reaching in its importance, and as we have no interest in the matter save as citizens, and our general interest in the public welfare, we invite criticism and discussion from the sanitary engineers among our readers.

The Cost of Pavements in New York.

A correspondent of the New York *Times*, this week, finds fault with the exorbitant cost of street paving in this city as laid down on Fifth Avenue last year. According to his information, the pavement referred to cost $3.05 for the concrete foundation and $3.09 for the stone-blocks, making a total of $6.14 per square yard laid.

To support his argument that this sum is unreasonable, he makes public the following answer to a query concerning the history of late street paving in Providence, R. I.:—

CITY ENGINEER'S OFFICE, CITY HALL, PROVIDENCE, R. I., July 30, 1885.

The Hon. Thomas A. Doyle, Mayor:

DEAR SIR: In reply to letter of Rush C. Hawkins, Esq., of 22 inst. referred to this department, I have to say as follows: The following are the contractor's prices for doing the work in Westminster street: For the removal of present pavement, excavation, preparation of roadbed, furnishing and laying concrete foundation, furnishing and laying granite blocks, including the filling of joints with pea gravel and asphaltic mixture, $2.83 per square yard. The cost of the concrete foundation per cubic yard was $2.50, or for a square yard five inches in depth 35.6 cents, plus the extra depth (five inches) of excavation, 3.4 cents, making a total of 39 cents per square yard.

It may be a matter of surprise that the work was let for such reasonable figures, and that the contractor received a profit, but to one familiar with the locality it is easily understood. All the sand and gravel was obtained from an excellent bank within five-eighths of a mile of the street nominally at the cost of the labor in screening and carting to the street. The dumping ground for the excavation was within one-half of a mile of the street and near the freight station, so that the carts brought back the blocks. The labor was also obtained at a very low figure. The pavement has been laid about five years. There have been no repairs made on account of wear or inferior work. It is at present in good condition, and is the best paved street in this city. For durability I think this pavement excels all others when careful attention is given to all details of the work.

Yours respectfully.
SAMUEL M. GRAY, City Engineer.

CITY OF PROVIDENCE, EXECUTIVE DEPARTMENT, CITY HALL, Aug. 1, 1885.

DEAR SIR: By direction of His Honor, Mayor Doyle, your communication of July 22, was referred to the City Engineer, and his Honor directs me to inclose his reply to this office. He also desires me to state that he fully coincides with the City Engineer respecting the durability of this pavement, and that he will be pleased to give any further information desired. Very respectfully.

CHARLES R. GIBBS, Mayor's Clerk.
RUSH C. HAWKINS, Esq., New York.

Although the conditions in the above case were exceptional and the work was done in one of the very best governed cities in the Union, the difference between $3.22 and $6.14 is too great to be accounted for on any business basis; the latter clause in the stated conditions may have more weight in explaining the matter. If so the tax-payers should import a modicum of Providence city government; it would pay immensely.

The American Association at Ann Arbor; Section of Mechanical Science.

While the late meeting of the American Association for the Advancement of Science, at Ann Arbor, Mich., was very successful in the value of the papers presented, we have the most intimate connection with the proceedings of the section devoted to mechanical science. We give a short report of the action of this section, as follow:

The four divisions of this section are:—Technical education, accurate standards of measurement, general scientific and practical engineering, and original investigation. The first paper read was by Mr. L. S. Randolph, on the Strength of Stay-bolts in Boilers. The writer made experiments designed to investigate the breaking of stay-bolts between the fire-box and boiler-shell. The theory was that the extreme difference of temperature—sometimes 200° Fahrenheit—induced a parallel shifting of these plates, and caused bending of the bolts and finally breaking; the adoption of a link in place of bolts was not practicable owing to the slight distance between plates. Proportioning the stays so as to bend without touching the elastic limit was suggested; it was shown that stays sometimes wore away by vibration or continuous bending, scales were thus formed and thrown off until the oxidation under the effect of water and renewed bending formed other scales, and the section was thus gradually reduced.

Prof. D. P. Todd presented a short paper on A Universal Form of Pressure Motor. Stephen S. Haight described the use and value of Accurate Standards for Surveyors Chains; he used a flattened steel-wire with thermometer attachment, spring balance and spirit level. Profs. Davis and Rogers made remarks upon the same subject. Prof. Rogers called especial attention to the necessity of greater precision in the use of calipers, and proposed a standard in each tool-room of a shop.

Prof. J. B. Webb read a paper on The Lathe as an Instrument of Precision; and Mr. C. G. H. Woodbury followed with a paper on the Coefficient of Efflux of Automatic Sprinklers. These are intended for use in extinguishing fires, working automatically by the melting of solder under the action of heat. These pipes are often too small to deliver the proper volume of water; the author gave the results of his experiments in determining the co-efficient of efflux and the formula for discharge, also the means of determining the numbers of sprinklers on given pipes, which will make the loss due to friction approximately equal. Mr. Frank C. Wagner presented an elaborate paper on Electric Light Tests. Prof. M. E. Cooley explained and illustrated a Method of Testing Indicator Springs. Dr. Alex. Hogg read a paper on Deep Water at Galveston, Texas. He advocated a break-water extending 2 miles out from shore as the best solution of the problem.

Prof. R. H. Thurston was the author of a valuable paper on Cylinder Condensation. The discussion on the best method of teaching mechanical engineering was opened by Prof. J. B. Webb; he thought that technical schools should give thorough preparation in

theory and principles, and insisted upon the importance of such practical knowledge and skill as will enable the foreman or engineer to instruct, direct and show his men how to do work. Prof. R. H. Thurston said that the training school should be adapted to the work to be done, and favored classification of these institutions into manual training-schools, schools of mechanic arts and schools of engineering. This would enable the student to advance to the point for which nature had best fitted him. Teachers of engineering should have had good training and a broad practical experience in actual engineering work, and should constantly supplement this knowledge by reading and study; such men, he says, are at present rare.

Further discussion showed that there are no training-schools where a boy can learn a trade before entering the higher schools, and that the St. Louis and Chicago manual schools will not make workmen out of 5 per cent. of their students. The debate was interesting and the results likely to be of value.

The Market Street Bridge, Philadelphia.

Petitions are now being actively circulated in Philadelphia, and are signed by many of the most influential citizens of that place, asking that instead of $1,000,000 being spent for the proposed stone bridge across the Schuylkill at Market street, two steel or iron bridges be erected; one at Market street, and the other across the same stream at Walnut street. The petitioners say that they have bids from responsible parties offering to build both of these bridges for $750,000.

While the sum named seems to us rather small for two bridges of adequate width and strength, under the conditions, the amount mentioned for the stone bridge is, evidently, underestimated, if proper foundations for the flat stone arches are to be supplied in the treacherous material found on the west bank, and firm foundations put under the river piers. The structure should stand on the rock, and all subaqueous work should be stone masonry; concrete is an excellent material when built where it can be constantly inspected and each stage of the proceeding carefully watched. When placed under water, in the mass and to the depth here proposed in the accepted plan for the stone bridge, it may be good, but who knows it?

A stone bridge, resting on concrete piers and concrete abutment foundations, is therefore a very risky undertaking; and we rather think there is wisdom in the citizens' choice of steel or iron. The metal bridge can be built much cheaper and more rapidly, and the cost will but little exceed that necessary for the properly constructed foundations of a first-class, flat-arched stone bridge. The other advantages claimed by the petitioners, that one pier will be sufficient for a metal bridge, and two are necessary under the stone, are also valid and worthy of consideration. Philadelphia has been unfortunate in her bridges across the Schuylkill river, and it behooves her to move with caution in the case under consideration; the site is a bad one from several points of view, in foundations, depth of water and low street level.

The Investigation of the U. S. Coast Survey.

Prof. Alexander Agassiz, of Cambridge, writes to the N. Y. *Evening Post* of Sept. 10th, a timely and very sensible letter upon the present investigation into the methods of the U. S. Coast Survey.

He states that thus far the public have been liberally supplied with inaccurate and ex-parte statements in regard to this affair; the chief officers have been condemned without a hearing, suspended, in fact, before the investigation commenced, and scientific men have no seat in this tribunal which presumes to judge how money shall be expended for scientific purposes. As the writer very properly remarks, a clerk in the Auditor's office is not a fit person to decide upon the scientific expenses of the Coast or Geological Surveys, or those incurred in compiling a nautical almanac.

We regret exceedingly that there should have been any ground for complaint against a bureau whose present and past work is of so much importance to science and the country at large. And so far we have only the evidence of a committee of unscientific, and probably somewhat prejudiced, men to back the many injurious statements made. These Treasury experts treat lightly of "pendulum swinging," because they do not understand its purpose or results, and if *they* are to have the virtual future control of the "business portion" of our scientific bureaus, as some propose, the condition of affairs would be lamentable indeed so far as work of any scientific value is concerned.

These bureaus cannot be too strictly or carefully managed; but the men who control them must be selected for their especial fitness for the main work on hand, which is pure science. There is no room in such a department for the "political scientist," and all who belong to that class should be got rid of as quickly as found. Prof. Agassiz very properly condems indiscriminate scientific assistance given by heads of bureaus to institutions and individuals; such work was never contemplated or sanctioned by Congress, and is discreditable to the government,

In the concluding words of the letter referred to, "let the most liberal appropriations be made for our scientific bureaus, but let the requisitions be so complete and detailed, that the most open and fair criticism is invited." If this be done, and the men best fitted by their attainments absolutely control the affairs of these bureaus, one can hope for further good work. But if clerks in the Auditor's department are to say how and when the money shall be expended, the investigators had better carry their economical ideas still further, and discharge all the employées, and close the office doors.

The Suez Canal.

According to *Le Canal de Suez*, of Sept. 2, 1885, 304 vessels passed through the Suez Canal in the month of July last; of this number, 141 entered by the Mediterranean Sea, and 163 by the Red Sea. The gross tonnage for the month named was 746,531 tons, the net tonnage 528,671, and the total receipts were $1,027,266. As compared with July 1870, the number of vessels was 39, in the year last named, the gross tonnage 55,943 tons, and the receipts $86,415.

There were in July, 1885, 2,720 passengers, 2,324 going to the East, and 396 returning. The tonnage of merchandise was 38,410 tons, 24,910 tons going out, and 13,500 coming from the colonies. The chief element of return freight in July, was grain, amounting to 64,450 tons, carried by 26 ships. These loads came from Bombay, Calcutta, Pondichery, Kurrachee and Penang; and are consigned to London, Maresilles, Bordeaux, Liverpool, Antwerp, Rotterdam, etc. Tea ranks next, with 52,600 tons, carried by 17 ships; 34,490 tons of rice required 13 ships to transport it, and 4 ships have carried 8,600 tons of salt to Bombay and Calcutta.

The average time of passage through the canal was 34 hours 53 minutes per ship; the delays caused by dredging, in this passage, amounted to 1 hour and 16 minutes on the average.

ENGINEERING NEWS Three months for One Dollar.

The Industrial Situation.

A good many buyers of railway material, especially steel rails, have been taken by surprise this season by the advance in steel rails from $26.50 to $28.50 and $29 per ton. They argue to themselves that since railway construction had fallen off from 2,387 miles last year to date, to 1,623 miles this year to date, that rails would not advance. In fact some buyers were anticipating a decline to $25 despite the fact that these figures do not cover cost. It was thought that the steel rail makers would compete bitterly for business and drive prices still lower. Instead of doing this they met and agreed to advance prices to $30 per ton after January 1st. The result was a rapid influx of orders, large and small, for delivery during the rest of the year. It is understood that at present a good many orders are being crowded in for delivery during December, and it is stated that in the course of two or three weeks, at the present rate of progress, there will be very little capacity left disengaged. This is the rail makers' side of the question. Rail buyers admit that they have been caught napping, and now regret that they postponed their orders so long. It has been the subject of comment among iron and steel makers, that rail makers deferred this action so long especially in view of the fact that there are so few to control, and that their interests are so identical. In the case of an industry where there are fifty or one hundred or more manufacturers to control, it is not surprising that unity of action is found impossible, and especially where a variety of products are made, but the eleven or twelve steel rail making firms were not beset with that difficulty. All they had to do was to agree together to do what was to their evident interests. Its result was postponed by the action of one or two companies who for the past year have been taking orders below those figures fixed by the other manufacturers. The limit of endurance was finally reached, and thus the opportunity for combination was presented. There was no haste made to embrace it. At last, however, the combination resolved to act, and today we find steel rails selling at $28,50 to $29, with $30 fixed as the inside limit after January 1st.

Railroad authorities differ as to the projected mileage. It has been variously estimated at from ten to fifteen thousand miles. Every week brings to light some new projected road. Reasons for delay in inaugurating new enterprises are well known. The country is waiting until it grows up to the mileage supply. The action of the rail buyers indicates that they believe the country is on the eve of a general improvement. The rush of orders for the past two weeks show that a marked improvement must take place in railroad building. The rail makers have resolved to make only 750,000 tons this year, which is several hundred thousand tons less than the consumption of former years. There is no reason why this combination cannot be preserved, and they say there is no reason why prices should fall below $30; but the question arises, can the rail makers hold together? That figure allows a very fair margin. They argue very sensibly that it is better to make three-quarters of a million tons at $30 than one million tons or more at $27. What, however, is to prevent one of the combination from quietly taking an order at $29 and filling his order books with six months production. This has been done in the past and there is no reason why it may not be done again. If so, we may expect to see a cutting that brought prices down to their minimum limit of thirty days ago.

Favorable reports are received from every branch of the iron trade. The wrought-iron pipe manufacturers are extremely busy. In fact, they have more business on their books

than they have had since wrought-iron pipe making was an industry. Much, and perhaps most of this activity, is due to the demand created by natural gas. Manufacturers in Western Pennsylvania are using it in every possible case, and some two or three hundred miles of pipe are projected which will probably be built, if not this fall, early next spring. The bridge works throughout the country are quite busily engaged on bridge iron. Manufacturers of structural iron have their entire capacity engaged at present, and from statements made by them have nearly sufficient work to keep them busy until January 1st. The policy of railroad companies is to remove wooden bridges as their means will allow, and replace them with iron structures. There are at present inquiries for large amount of structural iron on the market.

The Western Nail Works are still idle, and requirements of consumers there are being temporarily met by drafts upon Eastern stocks. The capacity is about 12,000,000 kegs per annum, while the consumption is about 7,000,000 kegs. This allows a sufficient surplus for strikes and suspensions, and the Western nail makers are taking advantage of the present surplus of stocks to tire their workmen out. Quotations range from $2.10 to $2.30 Prices are tending upward. Active preparations are being made at Birdsboro, Pa., for the manufacture of nail plate, and if the experiment is successful Eastern nail mills will be supplied with material from that mill. If it is not successful a large mill will probably be erected to make steel, either by the Bessemer process or by some one of the processes which are passing through their experimental stages.

The sheet mills throughout the East have been running well all summer, but in the West troubles have existed which kept a large amount of capacity idle. Agreements have been made in many cases, and the mills are now at work.

The plate mills throughout the country have been working in a hand to mouth way since last spring until about mid-August, when orders for fall began to flow in, and at the present time nearly all the plate mill capacity is well engaged.

The bar mills are doing more than they have for months, but a great deal of that capacity is still awaiting employment. Prices range from $1.40 for common to $1.80 for refined. The car works have been taking orders quite freely and are now well supplied for ninety days. The railway managers have been deferring the placing of orders for cars and locomotives and are now increasing and improving their rolling stock. Several fair orders for locomotives have been given out, one for thirty engines in Rhode Island and several others for smaller numbers of engines. The locomotive capacity, however, is far ahead of any probable requirements for a year or so to come. The last furnace industry, North and South, is in a rather unsatisfactory and uncertain condition. Competition between Southern and Northern irons is increasing. Eventually Alabama and Tennessee irons will occupy a very prominent part in the iron industry, but the progress of iron making in the South must of necessity be slow, despite the evident advantages possessed at certain points in that section. The Pennsylvania and Ohio furnaces are meeting the requirements in a very cautious way. Any advance is likely to stimulate production. Prices range from $14 to $14.50 for forge in Western Pennsylvania; $15 to $15.50 in Eastern, and foundry irons are $16 to $18 generally. Muck bars range from $26.50 to $27. The merchant steel mills have a large amount of business in hand, and the demand generally for steel is improving, because of the applications of steel to a constantly increasing variety of uses.

The iron trade in general is better than it has been since the opening of the year, and many believe that it has emerged finally from its depression. It would be very unsafe to make such an assertion because of the backwardness of railway construction. Nothing but the building of five or six thousand miles of railroad per annum will give the iron trade the strength which it needs. Unless that is general, prices will be weak; combination can strengthen them, but this is possible only in exceptional cases.

The anthracite coal industry is in an unsatisfactory condition to producers. Consumers are gratified at the fact that this strong combination is obliged to bow to the law of competition. Even the present prices are higher than they would be under unrestrained competition. The allotment agreed upon for this year is 30,000,000 tons and so far the production is a trifle under 20,000,000, tons up to this date. Buyers everywhere purchasing only for current equipments in view of a further decline in prices. The production of bituminous coal is gaining ground. the Beach Creek, Chesapeake, Ohio an Pocohontas coal regions have thrown 1,000,000 tons of soft coal into the market, and this is helping to crowd down Anthracite, and to press down prices of all kinds of coals. New coal regions are being developed in Ohio and West Virginia.

Pavements Here and Abroad.

Capt. F. V. Greene, U. S. Engineer, who has recently returned from Europe where he has been examining street pavements at the request of the Barber Asphalt Paving Co., of Washington, gives the following summary of the results of his trips to a *N. Y. Tribune* reporter:

"French rock asphalt pavement in the city of London still holds its own, and while no asphalt has ever been taken up to replace it with wood there have been cases where the wood has been taken up and replaced with asphalt. The asphalt is confined to 'the City,' however, where it was introduced to relieve the intolerable noise of stone pavements, and to get something cheaper than macadam, which under heavy traffic is the most expensive of all pavements and always dusty or muddy. There are about eleven miles of asphalt in 'the city' and two miles of it only in other parts of London. In the West End the new pavements are largely of wood which is so noiseless and while it lasts so smooth that it is quite popular. It has to be replaced every six or seven years, and for the last two or three years of its life it is somewhat rough, but the Londoners seem willing to stand the expense and trouble of renewing it so often in order to do away with the racking noise and wear and tear of stone pavements. Nearly all the main lines of travel west from the Bank of England, and the principal cross streets such as Regent street and St. James street, are paved with wood. The asphalt does not seem to have spread in the West End of London, as they are only familiar with the rock asphalt variety, which becomes very slippery under heavy traffic and is quite different in this respect from the American or Trinidad variety.

"In Paris nearly all the inner and the outer lines of boulevards are paved with wood as well as a portion of the *Avenue des Champs Elysées*. The broad *Place de la Concorde* is now being paved with it. Nearly all of these have been laid in the last four years. The engineers of the Municipality declined to express any positive opinion as to its durability until it has had a longer trial. It is laid at a ruinous expense, under a system of annual payments (instead of cash down.) These payments in addition to the annual maintenance make the cost about $1.10 per yard *per year*, and the contract runs for eighteen years. The asphalt in Paris, which is also of the rock variety, had got into very bad order in 1883 owing to failing contractors on the maintenance, and this and its slipperiness combined to make it unpopular, so that it has not been extended greatly, and remains about thirteen miles in extent, as it was five years ago. New contracts have been made for its maintenance with responsible companies at thirty-three cents per yard per year, and it is now in very fair order again, although somewhat wavy in places as well as slippery.

"In Berlin the wood has been tried in the last three years but has broken up very rapidly and is pronounced a failure. The rock asphalt pavements have been largely introduced, and about ten miles have been laid in the last five years. Except for its slipperiness it is very popular, and is kept up for ten cents a yard a year, the traffic being very light in comparison with London and Paris.

"In all the great capitals of Europe it seems to be definitely established that they will not tolerate the roar of stone pavements, and that smooth and quiet pavements will be laid as fast as they have the money to lay them. Once laid they take great pains to keep them in perfect order and perfectly clean. They are scrubbing, washing, cleaning, sprinkling, sanding them, and picking up manure at all hours of the day and night. There are only two cities in America that compare with the European cities in this respect—Washington and Buffalo. Washington has the most asphalt (sixty miles) but Buffalo has the cleanest streets, the amount of asphalt being about twenty miles. Omaha also has very good streets, having about eight miles of asphalt. All of this is the American asphalt, which was adopted and perfected in Washington after a great deal of study. In Boston it has been laid on streets in the heart of the business section, where the traffic is as heavy as anywhere in London or New York. To the surprise of most people it has worn well and without any repairs for four years. This American variety has a large amount of sand in its composition and is not so slippery as the French variety."

PERSONAL.

WM. EDW. BARRINGTON, of Washington, D. C., has been appointed Division Eng. of the James River Valley Ry. with headquarters at La Moure, Dakota.

CAPT. ALBERT E. GOODRICH, one of the pioneers in navigation on the great lakes and founder of the Goodrich Transportation Company, died in Chicago on Sept. 14.

CHARLES M. SLOCUM, the assistant city engineer of Springfield, Mass., and HATTIE M. HANCOCK, daughter of the Superintendent of the water-works were married on the 10th inst.

GENERAL MANAGER JAMER MCCREA, of the Pittsburgh, Cincinnati and St. Louis Railroad, has been made general manager of all the lines of the Pennsylvania Company west of Pittsburg, with headquarters in that city.

MR. E. B. DORSEY, Consulting Engineer for the American Exhibition in London, arrived on Sunday. MR. DORSEY's paper on "English and American Railways Compared" was the subject of discussion at the meeting of the American Society on Wednesday evening.

MR. JOHN ROBINSON WHITLEY, Director General of the American Exhibition in London, arrived by the *Aurania* on Sunday night last, and is a guest at the Windsor Hotel. MR. WHITLEY will be in the United States for several weeks, engaged in business connected with the interests of the American Exhibition.

MAJOR J. F. O'BRIEN, formerly assistant general manager of the East Tennessee, Virginia and Georgia Railroad, has been appointed general manager and agent by the Receiver of the Lackawanna and Pittsburg Railroad, with office, at Angelica, N. Y.

MR. N. HENRY CRAFTS, has been engaged by the Cambridge, Mass., Water Board, as Consulting and Assistant engineer during the building of the new dam at Stony Brook and construction of the Fresh Pond additional supply system. Mr. Crafts has had extended experience in this branch of engineering and his services will be valuable to all concerned.

WILLIAM LORENZ. The following matter is extracted from a memoir of William Lorenz, late chief engineer of the Phila. & Reading R. R. Co., written for the Engineer's Club of Philadelphia. The meagre account of the life and services of Mr. Lorenz, published at the time of his death is sufficient excuse for these late notes:—William Lorenz was born in Osnabruck, Province of Hanover, Germany, Dec. 23, 1826. He received a thorough classical and technical education, graduating from the Polytechnic College at Hanover. After making himself practically familiar with me-

chanical engineering by an apprenticeship in a machine shop, he came to America on a leave of absence from the Hanovarian government to study the American Railway system. He was first connected with locomotive construction in the "Novelty Shops," but was shortly after appointed by J. Tucker, President P. & R. R. R., a topographer on the Lebanon Valley R. R., then being located; his connection with the Phila. & Reading R. R., thus commenced, was continuous until his death on Dec. 29, 1884, as Chief Engineer of the company. In 1856, he prepared and published a map of the canals and railroads for transporting anthracite coal; a map so accurate that it has been the basis of all later work in that field. In 1861 Mr. Lorenz became Resident Engineer of the Lebanon Valley R. R., and while residing in Lebanon he designed and built the spiral railroad at Cornwall, Pa., for the developement of the extensive iron mines at that place. In 1867, Mr. Lorenz introduced on the Lebanon Valley R. R., the pointed safety switch which bears his name: he had known the switch in Europe, made valuable improvements upon it and introduced it, but never patented it, and always disclaimed the idea of being its inventor. In 1872, after the death of Chas. E. Byers, Mr. Lorenz became Chief Engineer of the Reading system of railways, and remained in office until his death.

E. B. THOMAS, general manager of the Cleveland, Columbus, Cincinnati & Indianapolis and Indianapolis & St. Louis Railway Companies, has issued the following general order:

MR. G. M. BEACH is hereby appointed assistant general manager of the lines of these companies, with office at Cleveland, O.

MR. W. C. IRWIN is hereby appointed general road master, vice MR. G. M. BEACH, promoted, with office at Cleveland, O.

The office of engineer of bridges is abolished and the duties of same transferred to the general roadmaster.

Above appointments taking effect immediately.

The office of assistant general manager is a new one, created by the above appointment of MR. BEACH, who, as general roadmaster or chief civil engineer, has had the care of the property for many years. Mr. Irwin has been engineer of bridges under him. Both promotions are excellent ones and the announcement of them created a happy surprise among their many friends.

The American Society of Civil Engineers.

At the meeting of the society on Wednesday evening, Sept. 16, Mr. Edward B. Dorsey presented an addenda to his paper on "English and American Railways Compared," read at the Annual Convention at Deer Park. In the first part he handled the subject of construction and equipment; in the last paper he compares the running expenses of the lines of the two countries. As this interesting subject will undoubtedly be the subject of further discussion, we will defer any remarks until the entire matter is in, especially as the paper is chiefly statistical. Mr. Walter Katte also presented a detailed statement of the late fast running on the West Shore R. R., with a description of the percentage of grade, curvature, train lengths, etc.

Connecticut Civil Engineers and Surveyors.

The seventh meeting of this Association will be held at Middletown, Conn., Masonic Hall, Nos. 130 and 132 Main street, on Friday, September 25th, 1885. Headquarters will be at the City Engineer's Office, 146 Main street.

PROGRAMME: 10.00 A. M. (1). Opening Exercises; (2). Paper on Bridges, by C. M. Jarvis, East Berlin; (3). A visit to the East Berlin Bridge Co., Works, by special car. 2.00 P. M. (1). Interlocking as applied to Railway Switches and Signal Systems, by E. A. Hill, New Haven; (2). Sewer Gasses, by F. W. La Forge, Waterbury; (3). A visit to the Portland Quarries.

This is a delightful season of the year to visit New England in, and a day spent with the representative engineers of Connecticut cannot fail to be profitable and enjoyable.

CORRESPONDENCE.

Boston Main Drainage Works.

127 EAST TWENTY-THIRD STREET,
NEW YORK., Sept. 16th., 1885.

EDITOR ENGINEERING NEWS:—As other engineers, from your suggestive paragraphs in two late numbers of the ENGINEERING NEWS, may wish to order Clarke's "Boston Main Drainage Works" from the "City Messenger" of Boston, it may be as well to give them the benefit of my experience.

In good faith I sent the Messenger $1.50, supposing, in conformity with the last notice in the NEWS, that this amount would surely cover the cost of book and postage. To my surprise I received yesterday, *by express*, the book, with 38 cents charges to pay.

Of course I would willingly have sent the postage (probably about one-fourth of the expressage,) if it had been required, but I do not think much of this way of doing the business, especially as Mr. Clarke informed you first, that the price would only be $1.25. It looks as if Mr. Messenger were working a little private "spec." in the matter. Very truly yours,

J. F. FLAGG.

[There is something very remarkable about the business of selling the above book. We were notified by Mr. Clarke that the price was $1.25, and so stated in our review. Then we were officially notified by City Engineer Jackson that the price was $1.50, and hence our correction; next we noticed in the Boston *Globe*, that the Board for Improved Sewerage placed the price at $1.25. Mr. Flagg knew of this discrepancy in price, and, to be safe, remitted $1.50. The postage, (which was very naturally and rightfully assumed by the purchaser to be prepaid,) is 12 *cents*, but Mr. Flagg is called on to pay 38 *cents* express charges. If the book has been sent to other purchasers by the same method, say to San Francisco, then the City of Boston has been sanctioning a very petty, but very aggravating proceeding. New Englanders, of all people in the country, resent unnecessary levies on their pocket-books, and we are inclined to think that there is a mistake in reference to sending out this small, but very valuable work of Mr. Clarke's, which needs only to be known to be rectified. ED. ENG. NEWS.]

LITERATURE.

The Steam Engine Catechism. A Series of Direct Practical Answers to Direct Practical Questions. Mainly intended for Young Engineers and for Examination Questions. By ROBERT GRIMSHAW, M. E., Editor of *Power* and the *Journal of Railway Appliances*; author of "Grimshaw on Saws," etc. New York, John Wiley & Sons, Publishers, 1885, 16 mo. pp. 149. Price $1.00.

This book seems to be very well adapted for the purpose intended; the answers are clear and easily understood, and they cover almost every possible condition of the case. Formulas and mathematics are avoided except in their most simple form. It is a handy volume to have about in this day of civil service examinations.

Transactions and Proceedings of the American Society of Civil Engineers, Sept. 1885.

CONTENTS: "*The Preservation of Forests*," by FRANCIS COLLINGWOOD. Discussions by James B. Francis, E. A. Fuertes, D. J. Whittemore, T. Egleston, J. J. R. Croes, J. F. Flagg, Charles Latimer, A. W. Locke, Ed. P. North, J. F. Crowell, F. Collingwood, C. J. H. Woodbury, Mendes Cohen, A. M. Wellington, Gustav Lindenthal, O. Chanute and J. N. Tubbs.

Proceedings of the Engineers Club of Philadelphia, Vol V., No. 1.

CONTENTS.—*Wrought-Iron Stringers for the Substruction of Railroads*, William Lorenz; *The Pennsylvania Schuylkill Valley Railroad Tunnel at Phœnixville*, M. Van Harlingen; *Sources of Pollution in Storage Reservoirs*, A. Harvey Tyson; *Strengthening the West Main Abutment of Chestnut Street Bridge*, J. M. Titlow; *The Construction of Street Railways in the United States*, Wm. Wharton, Jr.. *Pertaining to Isthmaic Transit*, P. C. F. West; *The Water Works of Columbus, Ga.*, Jacob H. Yocum. Memoirs of William Lorenz, Arthur R, Faunt Le Roy, and David Hudson Shedaker. Reference Book and notes and communications.

Transactions and Proceedings of the American Society of Civil Engineers, July and August, 1885.

CONTENTS, July number:—"The Preservation of Timber:" "Report of the Committee presented and accepted at the Annual Convention, June 25, 1885;" O. Chanute, B. M. Harrod, G. Bouscaren, E. R. Andrews, E. W. Bowditch, C. S. Smith, J. W. Putnam, G. H. Mendell, Frederic Graff, *Committee*.

CONTENTS, August number:—"The Preservation of Timber:" "Appendices to the Report of the Committee presented at the Annual Convention, June 25, 1885." *Kyanizing*, Jas. B. Francis, H. Bissell; *Burnettizing*, J. W. Hobart, E. S. Philbrick; *German Experience*, Privy Councillor Funk; *Burnettizing* and *Creosoting*, M. Alexander, L. L. Buck, Ed. Larkin; *Thilmany Process*, O. Thilmany; *Wellhouse Process*, J. P. Card; *Gypsum Process*, Theo. Plate; *Creosoting*, J. W. Putnam, E. R. Andrews; *Experience in N. Y. Harbor*, G. S. Greene, Jr.; *Creosoting*, M. G. Howe; *Boucherie Process*, E. Pontzen; *Burnettizing*, O. Chanute; *Creosoting*, E. R. Andrews; *Economy*, B. M. Harrod, Ashbel Welsh. Appendix No. 1 will be published separately.

Electrical Units.

The Congress on Electrical Units which assembled in Paris, 1881 has last year finally settled the practical electrical units in use all over the civilized world. As fundamental unit the Centimetre, the Gramme, and the Second have been adopted, and the system is called, for brevity, the C. G. S. system. Its unit of force is called the *dyne*. It is the force which acting upon a gramme for a second, generates a velocity of a centimetre per second. The C. G. S. unit of work is called the *erg*; it is the amount of work done by a *dyne*, working through a distance of a centimeter. The adoption of a complete and practical system of electrical units, based upon a simple fundamental unit has developed the study of electricity from a mere observation of phenomena into a science of exact measurement, though the fundamental law of the science was elucidated by Dr. G. S. Ohm as early as 1827, and subsequently confirmed by Pouillet, Feshner, and Kohlranch.

This law establishes the relations connecting the electromotive force (E), the resistance (R), and the current (C), viz:

$$C = \frac{E}{R} \text{ or } E = C \times R, \text{ or } R = \frac{E}{C}$$

This law further shows—

(*a*) That when a given electro-motive force is impressed at the ends of different conductors the current through them varies inversely as their respective resistance; and

(*b*) That for a given current passing the conductors, the difference of the potential at their ends varies directly as their resistance.

The electrical quantities and their units are—

1. *Resistance*—*i. e.*, electrical resistance is that of an actual force opposing the E. M. F., which maintains the current. It is analogous to friction in mechanics, for it tends to diminish the available energy of the current. The practical unit of resistance is called the *Ohm* (10^9 C. G. S.—*i. e.*, 1000,000,000 fundamental units). It is equal to the resistance of a prism of pure mercury 1 □ millimeter section and 106 centimeters long, at 0° C.

NOTE.—One yard of copper wire ¼ inch in diameter has a resistance of 0.002 ohm. Some selenium cells have a resistance of from 40 to 1000,000 ohm. A good telegraph insulator has a resistance of 4000,000,000,000 ohm.

2. *Electro-motive Force.*—This is the name given to the force which tends to displace electricity from one point of a conductor to another. The nature of this force and its causes are entirely unknown. The unit of E. M. F. is the *Volt* (10^8 C. G. S.).

NOTE.—This corresponds nearly to that of a Daniell's cell. One of De la Rue's batteries give an E. M. F. of 11,000 volts. Lightning flashes are probably many million volts.

Potential.—expresses the conditions of a body with respect to electricity. Prof. Thompson† describes electrical potential as follows: "The amount of work required to move a unit

† Paper read before the Royal Society, February, 1860.

of electricity against electric repulsion from any one position to another position, is equal to the excess of the electric potential of the first position above the electric potential of the second position."

The terms difference of potential and E. M. F. are not exactly synonymous, and it is useful to distinguish between them. Difference of potential for electricity is analogous to difference of level of water; thus the level A of a pipe may be different from that at B, the tap, if A be higher than B. This difference of level produces a hydrostatic pressure, which, when the tap is opened, makes the water flow, whilst the difference of potential for electricity is the E. M. F. which, on completing the circuit (the analogue of opening the tap,) establishes the current.

In a closed circuit in which a current circulates, the potential of all parts of the circuit is different; the difference depends on the resistance of each part and on the E. M. F. of the source of electricity.

Current—*i. e.*, intensity or strength of current, which must be proportional to the E M F and inversly to the Resistance. The unit of the electric current is calledthe *Ampere* (10^{-1} C. G. S. *i. e.* $\frac{1}{10}$ of the absolute unit of current) which is the current produced by one volt through one ohm.

NOTE.—One ampere is capable of precipitating 4 grammes of silver or 1.19 grammes of copper per hour, or of decomposing .0978 grammes of water per second.

4. *Quantity*—of electricity varies as the intensity, and also as the time; hence it varies as their product. The unit of quantity of electricity is called the *Coulomb* (10^{-1} C. G. S.), which is defined by the condition that one ampere yields one coulomb per second.

5. *Capacity.*—or the quantity of electricity necessary to raise the potential of a conductor from zero to unity. The unit of capacity is called the *Farad* (10^{-9} C. G. S., *i. e.*, $\frac{1}{1,000,000,000}$ of the absolute unit of capacity.) It represents the capacity of a condenser which holds one coulomb when charged to potential of one volt.

NOTE.—The Farad is much too large for ordinary purposes. Its millionith part the microfarad (10^{-15} C. G. S.) is used.

Megohms, megamperes, megavolts, megacoulombs and megafarads are one million ohms, amperes, etc., whilst microohms, microamperes, etc., are the millionth parts of an ohm, ampere, volt., etc.

Conductivity—or facility which a body offers to the flow of electricity. No special unit has yet been introduced

Conductivity is plainly the reciprocal of resistance.

The following two units were also suggested by Dr. C. W. Siemens at the meeting of the British Association in 1882, and were adopted by the profession, viz.

6. The *Watt* (10^7 C. G. S.), *as the unit of power*, being the rate at which work is done by a current of one ampere, flowing in a conductor, whose ends differ in potential by one volt.

7. The *Joule* (10^7 C. G. S.), *unit of heat*, being the heat generated in a conductor by one watt in one second.

9.—*Electrical*—HORSE-POWER: (746×10^7 C. G. S.) It is a larger unit for estimating the rate of electrical work done (per second), it is equal to the mechanical horse power and equivalent to the work required to raise

550 pounds through one foot
or = 76 kilogrammes " " metre
" = $76 \times 1000 \times 100$ gramme centimetre
" = 76×10^5 C. G. S.

Now the weight of one gramme at any part of the earth's surface is about 981 dynes, consequently one gramme-centimetre is equal to 981 ergs.

Thus 1 H. P. is also = $76 \times 10^5 \times 981$
or = 746×10^7 ergs.
and since 1 watt = 10^7 ergs.

$$\text{E. H. P.} = \frac{\text{watts.}}{746}$$

The following are equivalent expressions for the same amount of power, only expressed in other terms.

I. Rate of expanding energy:

1 volt-ampere = $\begin{cases} 10^7 \text{ ergs per second} \\ 1 \text{ watt} \\ \frac{1}{7.37} \text{ foot—pound per second} \\ \frac{1}{3.71} \text{ kilogrammeter per second} \\ \frac{1}{738} \text{ force cheval} \\ \frac{1}{746} \text{ horse power.} \end{cases}$

II. Work done or energy expended.

1,000 volt-ampere hours = $\begin{cases} 10^{10} \text{ erg hours} \\ 3,600,000 \text{ volt-coulombs} \\ 3,600,000 \text{ joules} \\ 1,000 \text{ watts hours} \\ 2,645,000 \text{ foot pounds} \\ 366,840 \text{ kilogrammeters} \\ 1.35 \text{ force-cheval-heure} \\ 1.34 \text{ horse-power hours.} \end{cases}$

One thousand volt-ampere-hours may also represent the supply for one hour, of a current of, say 10 amperes with an C M F 100 volts, which will produce two arc lights of about 2,000 candle power for one hour or 14 incandescent lamps of 20 candle power for the same space of time.

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TRACK.*

BY W. B. PARSONS, JR., C. E.
ROADMASTER SUSQUEHANNA DIVISION ERIE R. R.

(*Continued from page 172*).

During the winter the principle occupations (in northern climates), will be removal of snow, shimming track, unless the ballast is so good as not to heave, and keeping switches, frogs, guard-rails, etc., free from ice, while the frogs and rails themselves will be found to need more attention and more frequent changing on account of the inelastic condition of the road bed.

At other times the force can be economically employed in gauging track, tightening up and replacing bolts, and getting the ties and fence posts ready for the coming spring. Such is a sketch of the distribution of the work throughout the year. No work can be successful unless prosecuted in a systematic manner, so there must exist in the mind of the Roadmaster or Engineer a definite, preconceived plan of procedure, according to which he must marshal his forces as a general does his army; and the smaller the force at command, or the greater the obstacles to be overcome, so is there increased necessity for good judgment on the part of the leader.

Track is noly brought up to a high degree of excellence by hard, continued, patient work. One of the fundamental principles is to keep the whole track close to an even average, for nothing is gained by spending a large portion of the time in bringing certain spots to an entire degree of condition at the cost of neglect of others equally important. Therefore the Roadmaster or officer in charge should determine on a standard of excellence, to which to bring the track during the season, and then always keeping men at work on that piece which is worst, and as soon as this piece reaches the standard—for nothing is gained by exceeding it—set them at that which is next worst, and so on until the whole is raised equally. Then next season raise the whole again to a still higher standard, till finally the desired perfect track is reached.

Of the work of track repairs in detail the principal item is the putting in of ties, and as such is worthy of particular attention. Ties of course should be kept in the track to the full extent of their utility, which means as long as they are sufficiently sound to afford a firm support for the rail, and to securely hold the spike. When they are no longer able to properly do this, although perhaps not so rotten as to be dangerous, it is very expensive to retain them in the track on account of the rail becoming permanently bent, and the continual work in gauging and surfacing necessary to keep the track in line and surface. The first and great principle to be observed is to afford the same and continuous amount of elasticity in the rail support, which cannot be too strongly insisted upon. The waves of depression should be evenly transmitted, and broken as little as possible, for wherever it is broken an injurious vibration is set up. Thus, if among old ties occasional new and sound ones are interspersed, the old ties crushing easily under weight of the train give a greater undulation than would be due to the elasticity of the ballast in sound ties, which undulation is checked on reaching the new tie, and this action soon shakes the latter loose. In order to provide a uniform elasticity ties should be sorted so as to afford similar bearing, that is be put together according as they are large or small, hard or soft, and of greater or less durability, in order that the value of their service and length of life should be the same. It is therefore advisable to "tie up out of face," so that the support of the rail shall not be a succession of hard and soft spots. In addition to this reason it is better to "tie up out of face," and at the same time use durable ties in order that the road bed shall be allowed to settle and pack hard, and except at long intervals only disturbed for occasional small surfacing, as needed; furthermore, track can be more quickly and economically tied up this way than by patch work.

With old established roads, this practice is frequently objected to on the plea that it may waste part of the life of the tie; but this objection is met by putting into sidings any half worn ties that are taken out, where their term of life will repay the labor, or even by putting them in some other part of the track in company with ties of a similar character, to replace some occasional completely rotted ones, and so reap the advantage of not only saving a year or two's lease of life, but also by repairing such part better than would be done by introducing a new tie, and allowing it in turn to be retied wholesale, when the original ties have become unfit for further use. This method of procedure will be found to work to the excellence of the track and will be economical in the expense of the labor of surveying, for old and new ties, or ties differing in quality can be kept in surface only by constant work, whereas track tied out of face with similar ties, will run for years with little attention.

There are two ways of working track when ties are put in; one's to tamp it carefully and bring it to a perfect surface, the other to give it a fair surface with attention. By the latter method ties are put in faster, and by the former, track is left in better shape; but which method to pursue depends on the condition of the car. If the track is that of a first-class main line, it will be necessary to spend more time, tamp carefully, and bring the rails to good alignment and surface, while if the road is of minor importance where the track is not in good condition, it is best, unless there are very few ties needed, to hurry them in, and then go over the whole track again with careful work. An attempt in such case to show good results early, will end in patches of good and bad, and perhaps when the season is ended, all the ties will not be in. For track between two such extremes, good judgment must be the guide, and in deciding regard must be had to the condition of the track and the number of ties needed. In general, ties should be put in the track as rapidly and early as possible.

TO BE CONTINUED.

WORK ON THE SOUTH PENN.—JOHNSTOWN, Sept. 17.—All the sub-contractors on the South Pennsylvania Railroad in Somerset County last week quit work, and are removing their cars, carts, tools, and the machinery used in their work. The Collinses are still working three gangs on their contract, while Messrs. Shields and Darwin are working day and night at the big cut near the summit. Work on the Quemohaning Tunnel has been abandoned. Messrs. Fitzpatrick and McGovern have a few men still at work on the Negro Mountain Tunnel, and Charles McFadden keeps up the appearance of work with about a dozen hands at the Eastern portal of the Allegheny Tunnel.

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WATER

THE NASTY OLD SIDEWALK DRAIN.

O stenches foul, that rise by night and day,
Give thyselves voice and unto mankind say
The name of him who for a paltry gain,
Did damn his soul and place the sidewalk drain.

And when his name be known, let it be writ
That his abode is Hades' deepest pit,
Where on him pour, the while he helpless flops,
The devil's offal and the devil's slops.—*Courier Journal.*

CAMDEN, N. C., wants waterworks.

MILFORD, NEB., is agitating for water-works.

OAKDALE, NEB., wants a fire extinguisher.

OAKDALE, NEB., is agitating the question of a fire department.

RED CLIFF, COLO., is agitating the question of waterworks and fire department.

BEVERLY, MASS., has voted to cut loose from the Salem water supply, and erect works of its own at an expense not exceeding $150,000.

BATAVIA, N. Y., has decided to build waterworks at a cost of $50,000.

PUTNAM, CONN., is to be supplied with water from a pumping station.

JACKSON, TENN., proposes to have sewerage. A committee is now figuring on the cost.

WATER.—Sealed proposals will be received by the City Clerk at the City Clerk's Office, in the city of Crawfordsville Indiana, until 4 P. M. Sept. 21, 1885, for the erection of Water Works of the Stand Pipe and Direct Pressure System combined.

THE FIFTH AVENUE REPAVEMENT Commission on the 17th, awarded the contract for the repavement of Fifth-Avenue, from Ninth to Ninetieth street, with the exception of that portion from the north side of Thirty-second street to the south side of Thirty-ninth street which has already been repaved, to Matthew Baird, at $429,000. The contract will call for a concrete foundation and the best quality of granite block pavement. Nelson J. Waterbury, representing Charles, Guidet, one of the unsuccessful bidders, entered a protest against the action of the board. The bids of the other contractors ranged from $464,930 to $678,068.

PROF. SPENCER F. BAIRD, secretary of the Smithsonian Institution, has written an open letter regarding the beneficial effect of boiling in increasing the potability of water, a fact which, he says, does not generally appear to be appreciated or understood. He adds: "Had this practice prevailed at the first outbreak of the typhoid disease at Plymouth, Pa., it is very probable the number of cases of illness and of deaths might have been very greatly diminished. In cholera seasons this treatment is especially important, as water is largely the medium of introduction of the injurious influences into the system. During the Centennial Exhibition, I was stationed in West Philadelphia, near the Centenial buildings for six months, and although cases of diarrhœa were prevalent all around me, the use of boiled water appeared to be an absolute preventive. We had several cases of illness before we began to use this very simple precaution, but none afterwards. I have usually enough water boiled in the morning to last through the day. This is placed in a large water cooler, without ice, and drawn from when required to fill ice pitchers, etc. The water should boil actively for half an hour, in order to kill the germs of disease. Of course this is only effective in cases of organic impurity, as mineral poisons would not be destroyed thereby."

THE citizens of Central City, Neb., aroused by their recent fire, have just made a movement toward organizing a fire department. The city will vote on a $3,000 bond proposition to purchase apparatus.

THE muddle between the city council and the Brenham, Tex. waterworks company, still continues, and the indications are that the courts will have to settle the misunderstanding.

TREASURER RICHARDSON, of North Adams, Mass., has redeemed $60,000 worth of the water bonds, which have been running since 1865, and bearing 6 per cent. interest. They are refunded at 3½ per cent.

CHARLOTTE, MICH., on the 8th, voted largely in favor of waterworks. The city will be bonded for $40,000, and work commenced as soon as it is decided where water will be taken from.

THERE is trouble about the charges made by the company granted the privilege of laying mains in Gravesend, L. I. The Town Board proposes to insist upon a schedule of regular prices.

DURING August the daily consumption of aqueduct water in New Bedford, Mass., was 3,576,127 gallons, an increase of almost a million gallons over last August's consumption.

PLANS for a new dyke 1,000 feet long on the east side of the Hudson, opposite New Baltimore, have been prepared by the State engineer.

A SCHEME has been suggested whereby all the streams and rivers in the colony of Victoria will be vested in a board of management analogous to railway commissioners.

A TEST well was sunk by the waterworks committee of Fremont, Neb., last week, and an abundant supply of soft water was struck at a depth of forty-five feet. George Morgan, of Chicago, was awarded the contract to draft plans and specifications, to be completed in fourteen days.

PROF. JAMES T. GARDINER, on behalf of the N. Y. State Board of Health, is inspecting the sanitary work being done under act of the Legislature, at Rome and Elmira. He will also visit several other places and make inspections regarding their water supplies.

ABILENE, TEXAS, September 11.—Mr. Grosscup, of the firm of Grosscup & Keith, who have the contract to build the water-works, returned from the East to-day. He has bought pipes and pumping machinery, and work on the reservoirs begins immediately.

THE depth of water in the distributing reservoir at Ridgewood, Brooklyn, on the 15th, was eleven feet eleven inches, the lowest on record. When full it is about twenty-one feet, representing about 160,000,000 gallons.

A SPECIAL election has been called by the village of Waterloo, N. Y., to take place October 8th., to decide the question of waterworks by a public vote. The proprietors of the Seneca Lake waterworks offer to supply water from Seneca lake and allow the town fifty hydrants for $2,000 a year, for a term of twenty years.

THE irrigation question is receiving a great deal of attention in New South Wales. An elaborate report has just been filed by the Minister of Water Supply, discussing the rights of the colony to the water in the river Murray the matter being complicated by the claims of Victoria.

THE Government of Queensland is likely to conclude arrangements with an American contractor, Mr. Arnold, for sinking a bore in search of water in some part of the northwest country to a depth of 2,000 or 2,500 feet, the locality to be selected by Mr. Jack, the Government geologist. If the arrangements should be concluded the plant will be made in the colony.

PHENIX, R. I., is moving vigorously for a public water supply, Mr. M. J. Arnold has the matter in charge. The scheme contemplates the organization of a stock company to build, and it is claimed by those interested that it is a first class investment, sure to pay a rate of interest above that given by savings institutions. There was a meeting of subscribers on the 10th., at which time the company was organized and officers elected.

DALLAS, TEX.—The Edison Electric Light Company is contracting to light the city with the incandescent system.

The East Dallas Water Supply Company has subscribed sufficient stock to construct complete waterworks for that city.

A new gas company, organized among St. Louis capitalists, is contracting for an enlarged gas plant for both Dallas and East Dallas.

THE City of Mexico has let a contract for the construction of public water works. The work is begun and it is expected that it will be completed before the end of the year. This will cause a great change in the ancient city, and many of the poorer class will find their occupation gone. It has been the custom in the City of Mexico and the other large cities of Mexico, for carriers to supply people with water. They carry it from house to house, as vegetables are peddled in this country during summer.

THE Newark, O., water-works will probably be in operation by January 1.

THE Cambridge waterworks company, organized for supplying the village of Cambridge, Washington County, N. Y., with water, was incorporated last week. The capital is $10,000 and the following are the trustees:

James S. Smart, Thomas C. Gifford, Wm. McKie, John Larmon, C. T. Hawley, Jerome B. Rice, James W. Thompson, all of Cambridge. The principal office is to be located in that village.

MR. WM. S. BARBOUR, City Engineer of Cambridge, Mass., has just issued his report for 1884. The average daily per capita consumption in 1884 was 42.7 gallons, although part of this exhibit is due to excessive rain fall in 1884, as compared with 1883, and the decreased amount of water used through hand hose. Work on the additional water supply from Fresh Pond is progressing favorably, and considerable work has already been done.

THERE is an appreciable reduction of the consumption of water in Brooklyn, but not yet enough in view of the low condition of the ponds and streams. The consumption one day last week was 43,158,686 gallons, while the quantity pumped was but 42,137,035 gallons. On the corresponding day of last year the consumption was 46,778,414 gallons.

Commissioner Fleeman has abolished the charge of one dollar for each permit for a water connection with new buildings.

THE Clayton Air Compressor Works of Brooklyn, N. Y., finding their business rapidly extending, and requiring representation in New York City, have just opened large and commodious offices there, at No. 43 Dey street, less than a block from its junction with Broadway. Here will be exhibited their well-known Improved Air Compressors, Steam Pumps, and Mining Machinery in general, including Rock Drills, Hoisting Engines, Rock Crushers, etc. Estimates and general information freely furnished.

A JANESVILLE, WIS., delegation have been visiting Oshkosh and in a joyous mood discourse thusly: "We were shown the water-works, put in one year ago at an expense of $220,000—21 miles of pipe,—since which time more than ten miles of pipe have been added. The works are considered perfect, with a capacity to furnish a far greater supply of water than required. Those of our officials who are opposed to water-works need only to see the Oshkosh "plant" to be convinced of the folly of their opposition."—Janesville, Wis., *Gazette.*

THE irrigation works of Colorado are on a great scale. The "Grand River Ditch," in western Colorado, at the beginning, is thirty-five feet wide at the bottom, fifty feet wide at the top, five feet deep for the first ten miles, then diminishing until the last two and a half miles are sixteen feet wide at the bottom, with three feet depth of water. The grade is a little over twenty-two inches to the mile, which gives a strong current. One company engaged in the irrigating business has constructed over 100 miles of canals in the Rio Grande valley at a cost of $750,000.

THE men employed by the Syracuse, N. Y., water company to make a survey of Cardiff valley for a reservoir to supply Syracuse with water, have completed their work for the present. The reservoir would cover nearly 1,300 acres of the best land in the valley, embracing nearly all of some farms, and the best part of many others, and about forty dwellings. There is much gossip and speculation about the matter, and considerable anxiety on the part of those most interested, but very little is certainly known as yet. Without question it is a splendid place to build a dam at the Indian narrows, the bank on one side rising abruptly to a height of over a hundred feet, and the opposite hill still higher, with only a space between of some rods. A mile or so further up the reservoir would be a mile in width, with a depth of over fifty feet, with ninety at the dam; and it would extend over four miles up the valley. Should it be built it will ruin the beauties of the valley and its desirableness as a place of residence.

THE following papers from the Boston Common Council were passed in concurrence on the 13th.

To authorize the treasurer to borrow $850,000 for the new court house, as amended.

That the Superintendent of Common be authorized to prepare a site and foundation in one of the squares on Commonwealth avenue for the statue of William Lloyd Garrison.

That the act entitled "An act in addition to the act for the purpose of supplying the city of Boston with pure water" be accepted.

That the expenses incurred by the committee on water in investigating the recent purchase of pumping machinery by the Water Board, for the highwater system, be charged to the appropriation for high service.

The report of the committee appointed by the Board of Aldermen of the purchase of Fisher Hill was taken up, and Alderman Welch offered the following:

Ordered, That His Honor the Mayor having removed the members of the Water Board because of "the loss of public confidence," no further action in the matter is necessary on the part of this body.

BENNETT, NEB., is agitating the question of water-works.

NEWARK N. J. WATER.—Mr. Young said the main question to be considered was the claim of private corporations as the most desirable source of water-supply namely, the Pequameer water shed. A commission to assess damages, he thought, could fix them properly and remove this objection. Mr. Anderson deprecated so much public criticism of the water supply as calculated to injure the city. Mr. Young declared that the evil existed and must be cured, and no deception would avail. Ex-Ald. Barnet and others advocated a new supply, and after some further discussion the meeting adjourned, subject to the call of the chair.

KITTANNING, PA., Sept. 10.—The Kittanning Caloric Company, at a meeting of the directors last evening, re-modelled their by-laws and elected J. H. McCain President, George H. FOX, Secretary and Treasurer, and James G. Henry, Superintendent. The contract for supplying the borough with light expired on the 1st. inst., and the burgess having given notice to the company of this fact, and the Council failing to renew the contract, the company had all the standpipes supplying such light taken down or gas shut off, and in consequence thereof we are wandering by night in darkness. An enterprising lantern merchant just now could accumulate much wealth.

ENGINEER WHITELAW, of the Cleveland, O. water works, computed in 1881 that about 53 per cent. of the city's population took water. The entire pumping capacity of the department at present is 40,000,000 gallons per day. The tunnel to the crib will carry only this much, and the supply cannot be increased until another tunnel is built. About the greatest demand ever made upon the department was during February and March last winter, when 28,000,000 gallons per day was sometimes used. At present, only from 16,000,000 to 18,000,000 gallons per day is used. When the Fairmount station is in operation, no perceptible increase in the pumping force required will be noticeable. It is deemed best to have one half of the pumping capacity in reserve, but usually in this city all but one quarter of the pumping machinery is in use. Engineer Whitelaw is of the opinion that the high service system can be placed in operation sometime during November.

A TEXAN setting forth the advantages of his State, remarked that if they had plenty of water, and the climate wasn't quite so warm, it would be unsurpassed as a habitation. "You might say the same thing about sheol," was the quick retort.

It isn't quite so with Memphis. Her one trouble is water. The water works are supplied from Wolf River north; the large sewers empty into that stream below the water-works; the supply is at all times very bad, and becomes offensive when the Mississippi backwater adds to the filthy slush. Now and then Memphis makes a huge outcry, which is composed by the water company's assurance that the racket embarrasses a correction of the evil. But when the outcry is hushed, matters go on in the same old way, and the water gets no better very fast. Doak recently quoted on them the story of the Arkansaw hoosier whose hut didn't need a roof during dry weather, and it was impossible to put one on while it was raining. This seems to have been a home shot, and now Gen. Greene, late of the Confederate army, from Missouri, and a very capable engineer is on a tour of inspection North to secure better methods. For drinking purposes, most families have cisterns, but the hydrant service is bad enough.—*Nashville American.*

THE water-works system last week received its first severe test, since its completion, as a protection against fire. The fire in the yard and warehouses of R. McMillen & Company was the largest, hottest and most dangerous that has occurred since the system was put in. It occurred in a locality where great values were at stake and the nature of the property was very inflammable. Progress of flames in any direction would have destroyed immense wealth. The saw mill and sash and door factory of the company and Clark's mammoth carriage works were in imminent peril, and, had the fire reached the latter, nothing could have stayed its progress among the residences to leeward, many of them the finest in the city. The firemen state that twenty-four streams were pouring water upon the burning mass at one time and ten or twelve others were protecting surrounding property and buildings. Such an array of elements to fight fire with could not have been possible under the old system of protection by fire engines. It is safe to say that our old appliances could not have stayed the flames or prevented a disastrous conflagration that would have laid a quarter of a million dollars worth of property in ashes. Thus has the water-works in this instance not only paid for the hydrant rental for years but it has already saved the value of its entire cost. After this most severe test, our citizens may feel comparatively safe from further sweeping disasters from fires, and the insurance companies may well consider that the risks in this city are infinitely better protected than ever before. This should be a matter of gratification to our citizens and the source of a more liberal view of the situation in Oshkosh by all underwriters.—Oshkosh, Wis., *Northwestern.*

THE Homewood gas well, of George Westinghouse Jr., in Butler County, Pa., is said to be the deepest well in the world. It is over 6,000 feet deep, and the drill is still going down.

EAGLE ROCK, Idaho, appears to be one of the prosperous towns. An illustration of the class of business meant here, is shown in the success of the water works. Last May some parties came from Montana to see about putting in a system of water works for domestic and other purposes. Mr. Clifford went around to see how many people would take water at a given rental per month. Inside of three hours he secured enough promises to amount to $250 per month. The works, consisting of a steam boiler and pump an immense elevated tank and service pipes, were put in at a cost of about $3,000 per annum, and it is all the time increasing. Pipes will in time serve all families in town. The Utah and Northern shops and the company's houses, have been provided with water through small works, ever since the shops began operating here.

THE total length of the aqueduct from Lake Vrynwy to the present reservoirs at Prescot, near Liverpool, will be 67½ miles. It is to consist of three tunnels, through each of which the water may be passed without pipes and of three lines of parallel pipes. The discharging power of each line of pipes will exceed thirteen millions of gallons per day. A return of expenditure in connection with the works is issued, which shows for the last three months an expenditure of £54,087, and a total up to date up £1,250,555. The necessity for a new water supply for Liverpool has long been felt, and at the present time is becoming painfully obvious to the inhabitants, for at several intervals during the summer the supply has had to be curtailed. The climax of short service has been reached, it having been intimated at the meeting of the Water Committte, that owing to the dryness of the season the water in store at the reservoirs has dwindled down to an alarming minimum, and that a further reduction of supply is necessary. The hours of supply, therefore, are now only eight, viz., from 6 to 10 a. m. and 2 to 6 p. m. Under normal conditions the supply in Liverpool is continuous.

HENRY N. OTTERSON, a gentleman who gives his whole time to town affairs, a member of the board of of selectmen, and holding several other town offices, has sent the following letter to the mayor of Boston:

TOWN OF CLINTON,
BOARD OF SELECTMEN,
CLINTON, MASS., Sept. 7, 1885.

The Hon. Hugh O'Brien, Boston: Dear Sir—As I live in a town where the people enjoy pure water, to drink from off the hills of the adjoining town of Sterling, I naturally wish that other people might enjoy the same blessing. My idea to supply Boston with pure drinking water is this: Go out of the city on to the highlands and sink some artesian wells, so that the water could run into the city by gravitation through an independent pipe, and have a faucet in the houses for drinking water only. This water to be metered at one cent per gallon. Have some public fountains where any one could go and fill his pitcher free. This will obviate all necessity of going to New Hampshire for pure water. The expense will be comparatively small, as a twelve-inch main under any moderate pressure would supply the city. It seems as though the average consumption would not exceed one quart per capita. Now please figure the revenue to be derived from the sale of water at one cent per gallon, and also the good to be derived in maintaining a healthy city.

Respectfully submitted,
H. N. OTTERSON.

PARIS WATER SUPPLY.—There have, however, been some improvements in Paris lately, notably in the water supply. This city has had the reputation of having been behind other large cities in this regard. This is no longer true, the drinking water of Paris today is the best in the world, and is apparently more abundant than in New York. This fact has not been made public to the world, it is said, out of deference to the wine interest, which wishes tourists to believe that the water of Paris is unwholesome. The principal source of supply is from La Dhuis, a distance of 130 kilometres from Paris. The height of the reservoir at the springs is 128 metres, in the city 108 metres, which gives a fall of 20 metres. This one spring, for such it is, furnishes 20,000 cubic metres of water per day. The other source of supply comes from La Vanne. There are 136 kilometres of main aqueduct, which includes 14 kilometers of arcades and 17 of syphons. The height of the city reservoir is 80 metres, and it furnishes 110,000 cubic yards of water per twenty-four hours. The total outside supply, therefore, is 130,000 cubic metres per diem. The cost of the work outside the city was 40,000,0 0 francs, that is $8,000,000 of our money. The new aqueduct in New York will certainly cost $20,000,000 and may cost $30,000,000, for bringing the water one-third the distance. But there is no jobbery or plundering in the public works of France. I give these facts because they are not generally known. Of course this water is used exclusively in hotels and dwellings. The Seine water is devoted to fountains and street cleaning. Gallons are used on the streets of Paris to-day, where pints are employed to wash the streets of New York.—D. G. C. in *Record & Guide.*

THE Belleville, Ill., water works, are nearly completed.

CAMERON, N. Y., Sept. 10.—A gas well was struck here to-day at a depth of fifty feet, while one of the residents was boring for water. The gas is flowing with considerable force and oil speculators are already leasing land.

WATER FOR BOSTON.—The project of obtaining water for Boston from Lake Winnipiseogee is being commented upon by many about City Hall.

"I was on the committee on water on the part of the Common Council in 1881," said Councilman Rosnosky of Ward 16. "having served on that committee for three years. I said at that time that the supply was insufficient for the growth of the city, and urged Lake Winnipiseogee as a source of supply, which would furnish 100,000,000 gallons of the purest water per day."

"Is the water polluted?"

"Yes, to a small extent; but nothing like the Mystic or Cochituate systems."

Elliott C. Clarke, the well-known civil engineer, who has had much to do in connection with Boston's new sewerage system, thought the experiment would be a hazardous one.

"There must be some drainage into the lake, and we should have no control over this, as it is in another State. The expense attending the project would be, in the opinion of a great many, much more than Boston could well afford."

Alderman S. B. Stebbins said that he should be opposed to the proposition.

"I don't believe" he said, "that the Granite State law makers would ever grant such a privilege, as it might in a large measure cripple the industries of the State. If we did get the necessary permission the mill damages would be very heavy."

Chairman Rockwell of the Water Board was averse to expressing any extended opinion on the matter, but said that he was in favor of seeing what could be done towards improving the Mystic supply before looking for another.

Mayor O'Brien declined to talk on the matter.

For many years I have thought that Boston would have to resort to a better water supply than can be got in this immediate vicinity." said Hon. Charles J. Noyes. "The day will come when such places as Boston, Cambridge, Somerville and Chelsea, forming as they do almost one community, will have to unite in resorting to some adequate water supply. I know of no other supply equal to Lake Winnipiseogee which can be reached and made available.

Col. Henry W. Wilson, ex-Alderman Hersey, Alpheus M. Stetson and others thought the scheme of obtaining water from Lake Winnipiseogee not practicable.—*Globe.*

NEWS OF THE WEEK.

Contracting.

Macadamized Roads in Huntsville, Ala. — The question of the issue of bonds to macadamize the county roads is beginning to be agitated, in connection with an act for that purpose which is to be voted on by the people on the first Tuesday in November. The act authorizes the commissioners to issue $200,000, of $500 bonds, running thirty years, at an interest not to exceed 7 per cent., the proceeds to be applied to the construction of 125 miles of pike road.

New Platform for the Brooklyn Bridge.—President Howell of the bridge trustees has awarded the contract for iron work to build the new platform and stairway at the Brooklyn approach to Cheney, Hewlett & Co., the lowest bidders. The work will be finished in a month, and will cost in the neighborhood of $4,500.

The Brooklyn Elevated Railway Company will build a platform from its terminus at York and Washington streets to the bridge approach on Sands street.

The Illinois State House.—SPRINGFIELD, ILL., Sept. 11.—The State House Commissioners have finished the work of examining the bids for completing the State House, and awarded the contracts as follows; To the Hallowell Granite Company of Chicago, the stone and brick work for $94,055; Davidson, of Chicago, the granite work for $96,200; Davidson & Son of Chicago, the marble work for $47,808; Cuddell & Meisner, of Chicago, the carpenter work for $12,336; John Eastman, of Chicago, the plastering work for $8,375; Beaver, Wight, Wetmore & Co., of Chicago, the plumbing work for $2,400; H. A. Streetor, of Chicago, the iron work for $27,886; Paulson & Egar, of New York, the bronze iron work for $15,000. This makes the total letting foot up $304,062. The appropriation for this purpose, made by a direct vote of the people at the general election in November last, was $531,712, so that by the contracts now let the State House will be completed and a balance of $227,650 left. The result is so favorable that it actually surprises the Commissioners themselves.

LAWRENCE, MASS., Sept. 10.—The committee on public property to-day rejected all bids for rebuilding the Canal street bridge over Spicket river. The bids ranged from $23,000 to $29,500 for a stone bridge, from $20,219 to $29,000 for an iron bridge.

FISHER HILL RESERVOIR—Sealed proposals, addressed to the Boston Water Board, and indorsed, "Proposals for building the Fisher Hill Reservoir" will be received at the office of Boston Water Board, City Hall, Boston, until 12 o'clock M. of the 29th day of September, 1885.

For further particulars see the advertisement accompanying form of contract.

THE City Engineer, L. F. Bassett, and the City Trustees, of Sacramento, Cal., have been examining the water of the Blue Lakes in Amador and Alpine counties, with a view of introducing it into that city. These lakes are now the property of the Amador Canal Co.; the water now in the canal is unexceptional in quality and will give 40,000,000 per day. The lakes are 80 miles in a direct line from Sacramento and are 8,000 feet above sea-level; the temperature of the water is about 55°. The committee who examined the waters report, that there is an abundance of the best water; that there are unlimited storage facilities; that the water-shed is excellent, and that in order to obtain the water pure it should be brought in pipes from the main canal to Sacramento.

Alleged Chinese Railway Contract.—Nothing is known in London, says the *Pall Mall Gazette*, of the contract for the construction of a railway between Taku and Tungchaw in North China, which was alleged to have been made with a Manchester firm. The statement, which originated in Germany, was probably made with the object of helping German and Austrian agents to float a loan of one hundred million florins, which they are anxious to be in a position to offer to one of the Chinese Viceroys.

Eads and Brazilian Harbors.—WASHINGTON, D. C. September 8th.—Mr. Estill McHenry, of St. Louis, arrived to-day and had a conference with the Brazilian Minister. He is here on business relating to the improvement of one of the principal harbors of Brazil. The conditions which are to be overcome are very similar to those existing at Galveston. Plans and informations are being forwarded to Captain Eads, who is making a study of the work necessary. It is possible that he will go to Brazil to direct the improvements, but the negotiations have not yet reached a stage which determines that point.

New Buildings.—The bids for the construction of the new Science Hall at Madison, Wis., ranged all the way from $170,000 to $229,000, the lowest of which was $50,000 more than estimate made by the architect or building committee of the State Board of University Regents. The estimated cost of the new building is $115,000.

Thirty-one bids were opened by the Montgomery county, Miss., commissioners for a new jail building. Hull Bros., of Jackson, Miss., were awarded the contract, being the lowest bidder, for $31,950. The highest bid was $34,200. Work commences at once.

New buildings representing $400,000 are now in progress in Chattanooga, Tenn.

Monroe, North Carolina, is to have a $20,000 Courthouse

The Knowles Steam Pump Works, of New York and Boston, have issued a new edition of their catalogue of Pumping Machinery. It is a handsome production, and very handy in form. Among the numerous specalities manufactured by this firm, and worthy of particular notice are: The portable boiler and pump mounted on high, wide-faced wheels; the quick-steaming, stationary fire apparatus for the use of small towns and villages; the compound condensing plunger moving pump, recommended for its simplicity, efficiency, and high economy of fuel; it is already very popular in the deep mines of this country and Mexico, and the vertical sinking pump, for use in deep and narrow shafts, pumping out drowned shafts, etc., it has practically proved its usefulness under very difficult circumstances. Many other items of similar character, and the useful tables appended to the catalogue, will repay those who consult it. The office of the company is 93 Liberty street, New York.

Railroads, Bridges and Canals.

The Contract for building the bridges, culverts, etc., on the James River Valley railroad has been let to Long & Co., Minneapolis.

The Concord railroad pays 10 per cent. a year and sells at the rate of 212, while its charter forbids ever raising the dividend above that rate.

A New Road is Being Surveyed from Fort White, Fla., to Jacksonville via Lake Butler. It will probably cross the Florida Railway and Navigation at some place near Lowly.

The Stewartstown, Pa., R. R. was opened on Sept. 10. It runs from New Freedom on the Northern Central R. R. to Stewartstown; it is seven miles long and costs $65,000.

Before the Georgia Legislature.—The bill to incorporate the Darien Short Line passed.

The bill to incorporate the Bainbridge, Cuthbert and Columbus railroad passed.

The Berlin Iron Bridge Company, of East Berlin, Conn., has been awarded the contract, for building an iron bridge across the Susquehanna River at Williamsport, Penn. It will be five spans, of 200 feet each. It will cost about $50,000.

The Fitchburg R. R. is double tracking its line west of Millers Falls, where there is at present but a single track for some distance. Heavy rails are being laid and connected with the Fisher joint. Preparations are being made for the foundations of the second track portion of the Connecticut River bridge. A large supply of rails is on the ground.

The Ohio Falls, French Lick and Terre Haute, railroad company has filed articles of incorporation. The road will be 150 miles long and extend from the Ohio Falls, in Clark county, through Floyd, Washington, Orange, Martin, Daviess, Greene, Clay and Vigo counties, touching the Indianapolis and Vincennes railroad at Switz City to Terre Haute. The capital stock is $4,000,000.

A Bogus Rumor.—The statement to the effect that Mr. Austin Corbin, of the Long Island Railroad, has purchased for $650,000, a telephone patent is untrue. "That rumor," said Mr. Corbin, "will be the death of me. I am receiving about forty letters a day on the subject. I have bought no telephone patent, and I don't want to buy anything connected with telephones. The one I have in the office now is too much for me sometimes.

Notes From Wisconsin.—MADISON, WIS., Sept. 8.—George W. Pratt, Frank E. Wardens, John W. Hume, H. B. Harshaw and Charles Leiber, all of Oshkosh, as the incorporators, filed articles of association with the Secretary of State to-day of the Wolf & Wisconsin River Railroad Company, with a capital stock of $1,500,000. The proposed road is to extend from Florence to Abbottsford, a distance of 125 miles.

The Chicago & Northern Railroad Company to-day filed with the State Railroad Commissioners, its annual report for the year ending June 30, 1885. The total income was $541,206; operating expenses, $383,640; excess, $157,566; taxes, rentals and interest, $153,186; balance, $4,380; passenger earnings, $158,036; freight, $382,444; miles of road operated, 234; earnings per mile, $23.13; paid for construction and equipment, $50.541; persons employed 559; passengers carried, 146,978; tons of freight, 256,804.

Newport, N. H.—Bids for erecting the Sullivan county court house and town hall were opened Monday night. The contract was awarded to R. H. Beckwith of Claremont for $22,765, some contemplated features of the building being omitted. The contract provides that the structure shall be walled up and covered by November 15, and completed on or before July 1, 1886. It is to built of brick, with Nova Scotia sandstone trimmings.

F. E & M. V. R. R.—The grading of the Black Hills Branch is now nearly completed to Buffalo Gap, Dak., which is midway between Chadron & Rapid City. The contractor C. O. Treat has until July 1st, 1886 to finish the grading of the remaining half to Rapid City. However he has decided to complete it this fall and will commence work at once.

Tracklaying was commenced at Chadron Sept. 14th, and will be completed to Buffalo Gap this season.

The Dallas & Wichita R.R.—DALLAS, TEX., Sept. 10.—The city is congratulating itself over the signing of the contract between the Gould system and the Dallas and Northwestern Railway for the extension of the Dallas and Wichita Railway to Decatur. The Dallas and Northwestern pay 6 per cent. interest on a track valuation, or $10,000 per mile on the completed road from Dallas to Denton, and one-half the cost of maintenance of the track. The Dallas and Northwestern is to complete the projection from Denton to Decatur in twelve months.

The Ford County, Meade Center, and Southwestern Railway Company propose to build from a point on the Atchinson, Topeka and Santa Fe Railway, in Ford County, running southwesterly through Meade Center, Meade County, to a point on the south line of the state, the road being confined to the counties of Ford and Meade. The directors named are: Geo. E. Welles, Toledo, O.; R. M. Spivey, Allen Belemmon and Lestel, of Newton, Kan.; M. W. Sutton, of Dodge City; E. L. Meade, of Meade Center, and B. Fox, of Fowler. Capital stock, $1,000,000; place of business, Topeka.

A New Air Line Proposed.—It is reported that the Baltimore and Ohio Railroad Company is maturing a plan for the construction of a new air line between Chicago and New York. The present line would be used as far as Centreton, Ohio. From that point a direct new line would be built to New York, passing through Medina, Ravenna, and Warren, Ohio; Mercer, Brookville, Clearfield, Bellefonte, Sunbury, and Mauch Chunk, Penn., and Belvidere, Morristown, and Newark, N. J. A road constructed over this route would give the Baltimore and Ohio the shortest line between Chicago and New York. The entire length would be only about 750 miles, and the through time between the two cities not more than 15 or 16 hours.

Kittatinny Tunnel of the South Penn.—CHAMBERSBURG, PA., Sept. 14.—By a blast on Friday night the center of the Kittatinny Tunnel of the South Pennsylvania Railroad was reached, and Contractors Ackerman and Evans and their men made Gunter's Valley ring with jubilation. More work has been done in Kittatinny than on any other tunnel on the road, 2,310 feet having been driven in the East and 1,740 feet on the West end. There remain but 570 feet to be driven.

Scandalous Management in the Inventions Exhibition.—LONDON, September 12.—Somewhat of a sensation has been caused by the developement of certain scandals in the management of the inventions exhibition. It appears that a number of speculators have been allowed by the managers to take large spaces in the halls and to them retail this available space out to the highest bidders. It is also alleged that blackmail has been collected from certain exhibitors who desired to secure prizes. A private enquiry into these charges is now going on.

The Panama Canal.—The *Star* and *Herald* says: We shall see in the month of October, the first section of the Panama canal opened in its full length, breadth and depth. The first section will comprise a waterway from Colon to near Tiger Hill, a distance of 12 kilometres, and will inaugurate the existence of the first portion of the Panama canal. The coming year will be one of extraordinary feats in the annals of canal dredging. Ten powerful dredges will be at work on the Colon side, which will register a record never surpassed before.

Suddenly Stopped the Survey.—ABILENE, TEX., September 13.—The surveyors of the Gulf, Colorado and Sante Fe Railroad, who have been laying out the route for the extension of the road from Brownwood northeast, and who have been laboring several days in the southeast part of Taylor County, have suddenly knocked off work and disappeared from the field, giving no explanation to any one. The road is already under contract for extension to a point twelve miles above Brownwood, and this sudden quitting of work in Taylor County may mean that the road will not be extended further for the present or another route may be determined upon.

A Wisconsin R. R.—G. W. Pratt, H. B. Harshaw, Frank Worden, John Hume and Chas. Leiber have incorporated a company with $1,000,000 capital stock to build a railroad from Pelican Lake to Post Lake. The railroad will give access to 150,000,000 of pine. It is expected that work on the line will be commenced as soon as possible, and that some 15 miles will be laid early in the winter. Mr. Pratt has been in Milwaukee in the interests of the project. It is said that engines, cars and rails have already been contracted for.

Steel Sleepers.—The Northeast railway company, Belgium, has invited tenders for 2,000 tons of steel sleepers. This step has been taken probably because experiments made with metallic sleepers in Holland have shown that the renewals required amounted to less than 20 per cent. in twelve years. The value of a metallic sleeper condemned as past service is also much more than that of an old wooden one. Steel sleepers will, of course, be found more durable than iron ones, and may possibly exert an important influence upon the future maintenance of permanent way.

Western R. R. Notes.—It is now cheaper to ship by rail from St Paul to New York than by water, the rail rates being 26 cents per 100 pounds on grain, while the lake and canal rates are 30 cents.

Land sales of the Northern Pacific for the month of August amounted to $303,359 against $162,145 for the same month last year.

The Manitoba has made a pooling arrangement with the Canadian Pacific by which it gets about 14 per cent. of business done by this road.

It is probable that the Chicago, Burlington and Quincy will get control of the Hamilton and Shenandoah road, guaranteeing interest on the bonds. This road has been in the Wabash system.

There is a report that the Chicago and Northwestern will build from Centerville to Yankton, D. T. This will invade the St. Paul territory.

The Unbuilt Railroads of Georgia.—An examination of our statutes shows that there is almost a condition of stagnation in the construction of railroads in this State. There are now incorporated railroads with live charters aggregating 1,700 miles, the estimated cost of building of which is $25,000,000. The proposed roads pass through 87 counties, 32 of which are entirely without railroads. It is claimed that nearly all, if not all, of the chartered railroads are necessary to the development of the State, and would now be either completed or in process of construction, were it not that capitalists are unwilling to put money into railroad enterprises in Georgia because of the extraordinary powers exercised by the railroad commission. Before the people of the territory tributary to these proposed lines may reasonably expect that they will be built, some assurance will have to be given that those who own them will have the management of them.—Savannah, Ga., *News*.

Montana Surveys.—HELENA, Sept. 12.—Col. J. T. Dodge, who surveyed the Rocky Mountain division of the Northern Pacific as well as the Helena & Jefferson County branch, is in the city, accompanied by E. H. Beckler, who assisted in engineering the tunnel at Bozeman pass. They are here for the purpose of surveying a route for the proposed railway to connect the mining districts of Tenmile and Red Mountain with rail communication at Helena.

The South Penna. R. R.—PHILADELPHIA, Sept. 10th.—All the contractors on the South Pennsylvania Railroad Company, except two, have assigned their contracts at the request of the American Construction Company, which is building the road The two who have not assigned their contracts will probably do so in a short time. The company is paying off the contractors for work done, and soon all work on the line will be stopped until it is taken up by the Pennsylvania Railroad Company.—Phila. *Press.*

Annapolis Short Line Railroad.—ANNAPOLIS, MD., Sept. 10th.—A gentleman connected with the Annapolis and Baltimore Short Line Railroad, stated to-day that all the money had been subscribed by Boston capitalists to construct the road, and $100,000 is deposited in bank for this purpose. An effort will be made to connect with the Baltimore and Ohio near Baltimore, so as to get the use of Camden Station for a depot. The ground for the station at Annapolis has been secured and the right of way obtained.

Inclined Plane Company Chartered.—HARRISBURG, PA., Sept. 9.—The St. Clair Inclined Plane Company, of Pittsburg, with $60,000 capital, was chartered at the State Department to-day. The incorporators are Henry L. McLean, William S. Hughes, J. M, Eccles, William L. Jones, George B. Blood. The purpose is to erect, maintain and operate one or more inclined planes in Pittsburg from a point on or near Josephine street, between South Twenty-second and South Twenty-seventh streets to the top of the hill in the Twenty-seventh ward, to carry passengers and freight.

The Chicago, Central Indiana, Block Coal and Ohio River Railroad Company, was incorporated at Indianapolis, Sept. 1. The capital stock is $7,800,000. The directors are Henry B. Lovering, of Lynn, Mass.; A. C. Drinkwater, of Branton, Mass.; Edward L. Tobey, Orrin T. Gray, and R. H. Clauston, of Boston; E. F. Pilsbury, of Melrose, Mass., and F. Jones, of Hartford, Conn. The road is to run from Rockpopt, Spencer County, through the counties of Dubois, Martin, Greene, Owen, Clay, Parke, Fountain, Benton, Warren, White, and Jasper to the town of Hebron, Porter County, a distance of 350 miles,

Railroads to be Extended.—RALEIGH, Sept. 11th.—The people of Cleveland County, N. C., have voted a subscription of $125,000 to aid in the continuation of the railroad from Shelby to Rutherfordton, and also another line from Shelby through Burke County to the iron mines at Cranberry, in Mitchell County. It is also intended to connect Shelby with King's Mountain, N. C., and Yorkville and Charleston, S. C. in one direction, and with Cincinnati and intermediate points in another direction. The eastern route is to be built by the Massachusetts and Southern Construction Company.

The Midlands Railroads.—WEST CHESTER, PA., Sept. 9.—Hon. R. E. Monaghan, a director of the Philadelphia and Midlands, recently the old Chester County Railroad, says that since the road has come under a new management it will certainly be built. He says that by this route it is only twenty-one miles from Philadelphia to West Chester, which is shorter by four miles than the West Chester & Philadelpaia (via Media) and seven shorter than by the main line of the Pennsylvania Railroad. He is of the opinion that the road can be built and put in running order with rolling stock for $350,000.

Resuming the Work of Construction.—NEW YORK Sept. 9.—At the office of the Central Pacific Company in this city it is learned that work is about to be resumed on the Oregon and California Line connecting San Francisco with Portland, Oregon. The work was stopped some time ago, pending action by Congress in regard to the land grant claimed by the company. About 120 miles remain yet to be built to complete the line between the two cities mentioned, but the work includes heavy tunneling, and it will require some time to finish this section.

The Chignecto Ship Railway.—The Chignecto Ship Railway, which is about to be built by an English Company across the seven miles wide peninsula of Nova Scotia and New Brunswick, between the Gulf of St. Lawrence and the Bay of Fundy, will be the first railway of its kind in the world, and will be built on plans similar to those of Captain James B. Fads for the Tehuantepec road. The saving in distance to vessels engaged in the trade to be benefitted by the work is estimated as follows:

Gaspe to St. John, N. B.	429 miles.
Gaspe to Boston	200 miles.
Escuminac to St. John	483 miles.
Charlottetown to St. John	400 miles.
Charlettetown to Boston	220 miles.
Pictou to St. John	340 miles.
Pictou to Boston	170 miles.

Hopper Gondola Car.—Wm. B. Sears and John C. Matthews, of the Flint & Pere Marquette Railway, have invented a hopper bottom gondola car, which has been successfully tested, and is now in practical use on the Buffalo, New York & Philadelphia Railway. It embodies two end openings in addition to the one in the center of the car.

Rushing the Burlington New Line.—OREGON, ILL., Sept. 8.—This place is all astir with preparations for extensive work on the Chicago, Burlington & Northern Railroad. Kilpatrick Bros. it is said, are under contract to finish grading twenty-five miles west from this city by Nov. 15. There is much heavy work between Oregon and Polo in rock cuts over forty feet deep. The outlook at present is as follows: The right of way mostly settled for, sub-contracts made, about 100 men and teams at work, a car load of powder, 1,000 pounds of dynamite-cartridges for blasting arrived yesterday. Boarding houses and tents are going up along the line, and the contractors propose to work over 4,000 man on this end of the line as soon as they can be got here. The wages paid are a $1.50 per day for men, and $3.50 for man and team.

Philadelphia Capitalists in Kansas.—For many years Boston capitalists have held control of the railroad systems of Kansas, but through the stimulation of township, county and city subsidies, Jay Gould has entered the State and is building a number of roads. This has attracted Philadelphia capital, and a party of gentlemen are now on the ground and propose to build from Topeka to Ottawa, thence in a southerly direction until Memphis is reached. The following named gentlemen are interested: Simon Muhr, E. D. Smith, Solomon Levy, L. L. Bush, John Keller, Alexander McGaw, H. W. Bush, Victor Yerker, R. G. Jenkins, Henry Morris, Henry Baumgardner and M. Van Harlingen.

"The Longest Draw-Span in the World."—The Passaic Rolling Mill and Bridge Works, of Patterson, are building what will be, when finished, one of the longest draw spans in the world. It is to be 430ft. long, will weigh about 500 tons, and consist of iron and steel in the proportion of three to two. The machinery for latching, lifting the ends and turning the draw is all to be worked from the center of the span, and is fitted to be operated by either hand or power. The turn-table is rim bearing, turning on fifty wheels eighteen inches in diameter. The diameter of the drum is twenty-five and a half feet. It is the new bridge which the Minnesota and Northwestern Railway is constructing across the Mississippi River at St. Paul. The length of the entire bridge will be 1,430 feet.

A New Line in Kansas.—TOPEKA, Kan., September 11.—The charter of the Kingman, Pratt and Western Railroad Company was filed here to-day, looking to the construction of a standard gauge railroad, starting at Kingman, Kan., and running westerly through the Counties of Kingman, Pratt, Edward and Ford to the west line of Ford County, with a branch road from the most available point in Kingman County in a southwesterly direction, through Kingman, Barber, Comanche and Clarke Counties, to a point at or near Englewood. The estimated length of the proposed lines, is 261 miles and the capital stock is $5,000,000. Topeka is named as the principal place of business. The Directors for the first year are Job Mulvane, J. R. Mulvane, J. P. Griswold, J. W. Thurston and Byron Roberts, of Topeka; David Richardson, Charles Rickman and Geo. Willey, of Kingman.

Market Report of Engineering Materials.

New York, September 17, 1885.

NOTE.—The following Market Report gives wholesale prices on the New York Market unless otherwise stated. It is intended as a general guide to the estimating engineer, and both the range of material and the market location will be extended as rapidly as possible. We give it with this caution, that, as is well understood in business transactions, the amount of bill, distance from market centre and conditions of payment will have a material influence on the final paying prices.

IRON.

STRUCTURAL IRON.		
Angles	1.9c.	@ 2.2c.
Tee	2.2	@ 2.4c.
Beams and channels	3.0c.	@
Tank	2.	@ 2.1c
Shell	2.4c.	@ 2.5c
Steel plates, Tank	2¾c.	@ 3c.
WROUGHT-IRON PIPE., PITTSBURGH.		
Butt welded, black ... Discount	42½	@ 45
" galvanized ... "	35	
Lap welded black ... "	60	@ 62½
" Galvanized ... "	45	
Boiler tubes ... "	57½	
RAILS.		
Steel (large lots at mill)	29.00	@ 30.00
Old rails	19.00	
Old rail steel	17.00	@ 18.00
R R. spikes	1.8	@ 1.9
R R, splice-plates	1.55	@ 1.7.
R R Track Bolts Square Nuts	2.75	@ 3.00
Barb-wire fencing, galvanized	4¾c.	@ 5¼c
" " painted	3¾c.	@ 4¼c.
Corrugated iron		
Nails		
Iron	2.25	
Steel	2.40.	

METALS.

COPPER.		
Lake Superior	11⅛	@ 11¼
Other Brands	10⅞	@ 11⅛
LEAD.		
Com. Domestic	4.25	
Lead Pipe	.05¾	
Tin-Lined Lead Pipe	.15	
Sheet Lead	.06¾	
ZINC.		
Sheet	5⅛	@ 5⅛

BRICK.

(Cargoes afloat)		
Haverstraw ... per M.	$6.00	@ 6.25
Fishkill		
Up-River	5.37	@ 6.00
Jerseys	4.62	@ 5.75
Long Island		
" pale	2.75	@ 3.25
FRONTS.		
Croton red	11.00	@ 14.00
" dark	11.00	@ 14.00
" brown	10.00	@ 13.00
Philadelphia pressed	24.00	@ 25.00
Trenton "	24.00	@ 25.00
Baltimore "	37.00	@ 41.00
Buff "	33.00	@ 35.00
Enameled English	65.00	@ 130.00
" American	85.00	@ 120.00
Fire brick	25.00	@ 40.00

CEMENT.

PORTLAND.		
Gibb's English 400 lbs. per bbl	2.75	@ 2.90
K. B. & S. " "	2.85	@ 3.00
J. B. White & Bros., Portland Cement	2.65	@ 3.00
do Keene's Superfine,	8.00	@ 10.00
do " Coarse,	5.00	@ 6.00
Roman	2.75	@ 3.50
Largerdorfer German "	2.55	@ 2 80
Dyckerhoff, " "	2.90	@ 3.25
Stettiner " "	2.60	@ 2.65
Hanover " "	2.60	@ 2.65
Vorwohler, Lion "	2.90	@ 3.25
Alsen, " "	2.55	@ 2.60
Fieve "	2.40	@ 2.50
Saylor's American	2.15	@ 2.40
Windsor	1.00	@ 1.10
Standard } U. S, C. Co.		1.15
Cable's Portland }	2.15	@ 2.40
F. O. Norton		1.10
ROSENDALE cements	.90	@ 1.00

LIME.

Rockland common per bbl	1.00
" finishing	1.20
State, common	.90
" finishing	1.10
Kingston, ground	0.95
Add 25c. to above figures for yard rates.	

STONE.

Cargo rates at New York.

Amherst freestone, No. 1 per cub. ft.	0.90	@ 95
" " No. 2 "	0.75	@ 0.80
" " light drab "	0.80	@ 0.95
Berlin " in rough "	0.75	@ 1.00
Berea " " "	0.75	@ 1.00
Brownstone, Portland, Ct. "	1.00	@ 1.30
" Belleville, N. J. "	0.75	@ 1.25
Granite, rough	0.60	@ 1.25
Common building stone per load	2.00	@ 3.00
Base stone, from 2½ to 6 ft. lengths, per lin. ft.	0.40	@ 3.00

SLATE.

Purple roofing per square	6.00	@ 7.00
Green "	6.00	@ 7.00
Red "	15.00	
Black Penna. (at New York) "	4.50	@ 5.00

LUMBER.

Prices for yard delivery in New York.

PINE, Common box per M.	18.00	@ 20.0
" Choice "	55.00	@ 80.
Tally plank, 1¼ in. 10 in. dres'd. each.	.44	@ .50
Tally boards, dressed com. "	.28	@ .30
SPRUCE, Boards dressed "	.25	@ .28
Plank, 1¼ in "	.28	@ .30
" 2 in. "	.38	@ .40
" 2 in. dressed "	.43	@ .45
Timber per M.	20.00	@ 22.00
HEMLOCK, Boards each.	.18	@ .20
Joist, 2½ × 4 to 4 × 6 in	.17	@ .44
OAK per M.	55.00	@ 65.00
CYPRESS 1, 1¼, 2 and 2½ in "	35.00	@ 40.00
YELLOW PINE, Girders "	25.00	@ 30.00
Dressed flooring "	28.00	@ 35.00
SHINGLES, Extra shaved pine, 16in. "		
" sawed 18 in. "	5.75	@ 6.00
LATH, Cargo rate "	2.10	@ 2.25

PAINT.

Lead, white, American dry per lb	.04¾	@ .06
" in oil pure "	.05¾	@ .05¾
English, B. B. in oil	.06½	@ .06¾
Red, American	.05½	@ .05¾
Litharge "	.05	@ .05¼
Venetian red, American "	.01	@ .01¾
Indian red "	.05	@ .10
Vermillion, American lead "	.11	@ .11¾
Paris green "	.15	@ .19
Umber, Amer. raw and powdered per lb.	.01¾	@ .01¾
Drop black, Amer.	.08	@ .12
" " "	.09	@ .11¾
Chrome green	.05	@ .15
Oxide zinc, American	.03¼	@ .04
" French	.06¼	@ .06½

A Kentucky R. R.—LOUISVILLE, KY., Sept. 10.—A meeting was held to-night at Jeffersonville, Ind., and the Jeffersonville, French Lick and Terre Haute Railway Company was organized. The capital stock will be $4,000,000, Mr. Ramsey, of Philadelphia, it is understood, will furnish the capital to build the road.